

**Subject:** Final Minutes, Monthly Managers' Meeting (MMM),  
Longhorn Army Ammunition Plant (LHAAP)

**Location of Meeting:** Teleconference

**Date of Meeting:** 20 November 2019– 1:00 Central Standard Time (CST)

#### **Attendees:**

Army BRAC: Rose M. Zeiler (RMZ)

USEPA: Rich Mayer (RM), Dorelle Harrison and Bill Rhotenberry (BR)

AEC: Amanda Sherman (AS)

TCEQ: April Palmie (AP)

USACE: Aaron Williams (AW)

Bhate: Kim Nemmers (KN)

APTIM: Bill Foss (BF) and Praveen Srivastav (PS)

#### **Action Items**

**Bhate/APTIM:** KN stated that providing ability on the website for people to subscribe for email notices was discussed during the October 2019 MMM. KN stated that APTIM had determined that collection of information was possible, but that AEC was looking at it further. AS stated that the concern was collecting personally identifiable information (PII), which must be Army approved. RM asked for more details on what is considered PII. AS stated that the concern is using "mailchimp," which requires the collection of birth month and year which is PII. AS also said that first and last names are PIIs so AEC is looking at other options that only collects email addresses. KN stated that this item will remain open to keep the discussion going until resolved.

#### **Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update**

RM asked about the SmartMap because he needs a new username or password. BF stated that he still needs to follow-up.

BR introduced himself as the Remedial Project Manager that is going to replace RM.

KN stated that the air stripper blower was brought online on Monday, November 19, 2019 and the **groundwater treatment plant (GWTP)** operated without any issues on Tuesday, November 20, 2019. KN stated that the blower was last replaced about 5 years prior and will likely need to be repaired in 5 years again due to rusting and damage from moisture and the acid vapors. KN stated that the analytical data provided for the MMM included data from before the ion exchange vessel and after the first ion exchange vessel to evaluate the effectiveness of the removal of volatile organic compounds (VOCs) by the resin. KN stated that the removal varied by VOC, but was lower than expected with much of the VOCs treated prior to reaching the vessels. KN stated that the groundwater was discharged to the bayou while the air stripper blower was down, with the exception of the first week. KN stated that even though VOCs, methylene chloride in particular, exceed the maximum containment level (MCL), they are below the discharge criteria for the bayou. RMZ clarified that there was one release to the INF pond and that VOCs were not detected or detected at low levels below the MCLs for that discharge, which KN confirmed.

PS stated that previous email correspondence with the Army and Regulators had discussed that water within the excavations at **LHAAP-03 and LHAAP-17** would be sampled and could be discharged to the ground if detected concentrations in the water were below the applicable GW-IND MSC or site specific cleanup value.. PS explained that another two feet of the southwest wall at Area C at

**LHAAP-03** needed to be excavated. So, the water sample from Area C was sampled at LHAAP-03. PS discussed the results for the excavation water sampling for LHAAP-03, which had lead detected slightly above the cleanup goal of 15 micrograms per liter. PS stated that there is a lot of water in the excavation and more rain forecasted, so there is no plan to pump the water currently. PS stated that once the rainfall subsides, then water from Area C may be pumped and trucked over to the GWTP for processing. However, with the ongoing rainfall it doesn't make sense to pump now. AP asked if the area discussed was Area C to which PS confirmed. AP asked whether only the areas where we are not at clean up goals for the soil was where water was sampled to which PS confirmed.

PS stated that **LHAAP-17** Areas L, M, N, H, J and K were sampled based upon confirmation samples in those areas exceeding the cleanup value. PS stated that the water samples had explosives and perchlorate. PS stated that the plan is the same for this site as LHAAP-03 for now. RM stated that he was surprised by the explosives. AP stated that she was also. AP asked if the holes were dry prior to the rainfall. BF stated that the excavations touched into the groundwater so there may have been a few areas with some groundwater in the excavation but it was dry otherwise. AP said that the perchlorate was higher than expected since the soil wasn't being removed for perchlorate. RMZ agreed that the levels were high, but two of the excavations are within the hot area of the perchlorate plume. BF said that two of the deeper areas are within or right up against the plume area. AP clarified her understanding that digging stopped the LHAAP-17 units where munitions were encountered and then the water filled into the excavation holes. AP then stated that when the water is pumped out and the soil is backfilled then the soil is not likely to be clean. RMZ stated that the Army understands and that the containments make sense. RMZ asked BF if this is where the Planteco study was done to which BF concurred that Area H is where the study was done. BF said that old piping from the study was pulled up in that area. RMZ said that the pilot study was not renewed because, while the methodology made sense, there was no proof that the perchlorate in the soil wasn't being driven deeper. AP stated that the pilot study pre-dated her. RMZ explained that manure was applied to the soil in the pilot study area and then irrigated and perchlorate was lower following the treatment. RM said the question was whether the perchlorate was being treated or if the contaminant was being driven deeper down. RMZ said she believes that it was treating the perchlorate but was uncertain that some of the perchlorate wasn't being driven down deeper. RM stated that the area did smell like manure when he was out here in a few areas. RMZ indicated that final backfill of the impacted areas will be completed under a different contract. RMZ clarified final backfill will be done under this contract in areas with clean confirmation samples.

PS explained that a round of groundwater samples was supposed to be collected before injections at **LHAAP-04**. However, the baseline sampling event was missed in error so, of the fourteen (14) monitoring wells planned for sampling, eleven (11) wells were sampled when the issue was discovered a few days into the injections. PS explained that the other three (3) wells have emulsified vegetable oil (EVO) present in the wells, which is why those wells were not sampled. PS noted that samples were also collected in January 2019 so that data can also be used for the baseline. AP asked if the data from both events will be used in the RACR to which PS concurred. PS stated that total organic carbon (TOC) groundwater samples were collected one week after the injections at LHAAP-04 also. PS stated that the first quarterly samples will be collected in February 2020.

Regarding **LHAAP-16** mid plume injections, PS stated that after the emails last week, the extraction wells had been pumped for four weeks and that the reason for not seeing bromide was not known. PS stated that Army and Regulatory concurrence was received to shut down the recirculation system. EW-05 through EW-08 were then able to be injected. PS explained that the well head set-up with a polyvinyl chloride (PVC) coupling was put on injections wells 16IW25 through 16IW30 which are constructed of PVC. The seal was good with PVC on PVC connection and the wells were able to



receive EVO under pressure. However, when the same set-up was used on 16EW05 through 16EW08, the connections between the PVC head and the 6-inch stainless steel well was not good and so it did not hold under pressure. Gravity feed was initially used, but APTIM has been looking for alternatives because the rate for gravity flow was low. PS stated that stainless steel coupling that can be tightened are being obtained to allow injection under pressure. RM asked why the PVC is having less issues than the steel. PS stated that the contact between PVC and stainless steel is not holding up. BF explained that the fittings is just not as tight due to a slightly different outside diameter of the wells. PS stated that APTIM is setting up at Biobarrier 2. PS stated that performance data being collected for Biobarriers 1 and 3. RM asked if there is any significant difference in the data. PS stated that some of the performance wells are showing good distribution based upon TOC increases observed. PS stated that the data will be shared at MMMs as it becomes available. RM asked if the trichloroethene (TCE) went up on the other side of the bayou. PS stated that only one round water groundwater data for the two new wells (57 and 58) is available. PS pointed out that there was a field duplicate result for one of the wells which may look like an increase but in fact the data is from the same date. PS stated that remedial action operation RA-O sampling is completed for LHAAP-67 and -50 and that LHAAP-37 is being sampled now.

KN asked everyone to refer to the Document and Issues Tracking Table dated November 20, 2019.

- **Task 1** (Project Management) - KN stated that the October 2019 MMM minutes were now considered final. KN stated that AP had indicated the revised 2019 Restoration Advisory Board (RAB) minutes were acceptable but asked if RM had comment. RM confirmed he did not. KN stated that she would issue the minutes to the RAB board.
- **Task 3** (LHAAP-03) – PS stated that no documents were in progress but that soil excavation was underway as previously discussed.
- **Task 4** (LHAAP-04) – PS stated that there are no documents in progress but that in-situ bioremediation injections has been completed as of the 6<sup>th</sup> of November 2019.
- **Task 5** (LHAAP-12) – PS stated no documents in progress with the next RA(O) sampling event to be completed in December 2019.
- **Task 6** (LHAAP-16) – PS stated that no documents are in progress. On-going field work is presented above.
- **Task 7** (LHAAP-17) – PS stated that the field work was completed on September 29, 2019 with the stop work order from the Army. PS stated that backfilling is on hold due to water in the excavations. AP asked how long we expect to leave the excavation holes open given we are in the wet season. RM mentioned that the roads are also an issue. PS agreed and reminded everyone that a temporary road was built, which will likely need more gravel and dirt. PS stated that sufficient backfill is now available that meets analytical requirements of clean soil. AP stated that overflow is a concern with the site being near the bayou. RM said that he heard the one pit was overflowing. RMZ wondered if the pits were overflowing one to the other. BF said that he understood it was from one to another due to the temporary road, which is causing water from the ditch to go over the road. BF said that a diversion or berm could be installed at the site without being invasive. AP asked if we can pump some of the areas to open free board. BF said that the concern is that GWTP will not treat the explosives. AP said that she would be surprised if explosives were not considered in the original design of plant.

RMZ said that there are multiple issues including:

- Divert and mitigate the water going to the creek,
- How to treat via GWTP,

- Acceptable levels to discharge to the bayou (TCEQ),
- Possible to have free board in the excavations, and
- Where the contaminated water is versus the known groundwater plume.

BF said there are a lot of things that are feasible, but there are things to address. BF stated the solids suspended in the water is a concern for the GWTP. BF also said that the sheer volume of water is another issue as it is at least 100,000 gallons of water. PS stated that dirt could be used to create some berms if a dozer could be brought into the site. PS said that the west side is where the perchlorate is present (Area H, J and K), but that the east side (Area L, M and N) is where explosives are higher in groundwater. PS stated that the west side is where the plume is located. PS stated that area H is one of the highest areas of perchlorate in groundwater. PS said that explosives are not contaminants of concern for the groundwater. AP asked for the figure to be resent with the plume sketched in along with the wells. PS stated that wells 17WW02 and 17WW06 are for sure in the extraction system. PS stated that additional signage will be added and blocking of access to the site. AP asked about putting a chain up. RMZ said that this is the one site with chain and a sign due to exceedances of industrial exposure. BF said that the chain will need to be moved further down the road due to how the entrance was extended for trucks and a barrier will be needed on the back side of the site as well.

- **Task 9** (LHAAP-37) – PS stated that the Year 3 sampling is being started this week and will be shared in the January 2020 meeting. PS stated that the Year 2 Annual RA(O) Report is being prepared.
- **Task 10** (LHAAP-46) – PS stated that the validated data from groundwater sampling completed in August 2019 was provided with the October 2019 data package. PS stated that Year 5 Annual RA-O data report is in progress.
- **Task 11** (LHAAP-50) –PS stated that the Year 5 RA-O Report is being prepared and should be delivered to the Regulators in January 2020 following Army Review. PS stated that the annual RA(O) sampling was completed in November 2019 with the validated data to be provided at the January 2020 MMM. PS said that the ESD is being put into the AR. Remedial Action Work Plan (RAWP) was issued to the Regulators on 31 October 2019.
- **Task 12** (LHAAP-58) – KN stated that the Year 5 RA(O) Report was issued to the Regulators for review on October 30, 2019. KN stated that the recommendations for sampling changes were planned to be implemented in the December 2019 sampling event but that comments on the sampling changes would be addressed ahead of the sample collection. KN stated that the sampling results will likely be presented at the February 2020 MMM.
- **Task 13** (LHAAP-67) – PS stated that the draft Year 5 RA(O) Report is in internal review. PS indicated that the site was sampled the last week in October, and that data would be provided for the December 2019 MMM.
- **Task 14** (LHAAP-001-R and -003-R) - KN stated that the Annual Long Term Monitoring Report was final.
- **Task 16** (GWTP) – KN indicated that the 2<sup>nd</sup> Quarter 2019 GWTP issued to the Regulators on November 4, 2019, and that the 3<sup>rd</sup> Quarter 2019 GWTP Report was being prepared.
- **Task 17** (LHAAP-18/24) – KN stated that LHAAP-18/24 will be sampled in December 2019 and that the validated data will be provided at the February 2020 MMM.
- **Task 18** (Surface Water) – KN stated that the most recent surface water results are included in the November 2019 MMM data and that no issues were noted.

- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was issued final to everyone.
- **Administrative Record** – PS stated that the next AR update is being prepared with a cutoff of June 30, 2019.

#### **Update on other DERP Sites:**

- **LHAAP 18/24** – AW stated that the Proposed Plan was placed into the AR. AW stated that the Record of Decision (ROD) comments would be addressed by November 29, 2019. AP asked about comments being due 30 days later when the holidays fall. RMZ said that legal is currently reviewing and that the Army is trying to have comment responses out by Tuesday, November 26, 2019. AW recognized that this might not gain review time for the Regulators.  
Regarding TCEQ comments about including plumes maps with analytical results, RMZ said that the ROD contains simplified plume shapes in general. RMZ said that although she agrees that it is important to present data that gives the reader an idea of the magnitude of the contamination, she disagrees with AP that data from recent GWTP reports should be presented. Instead the FS plumes maps and potentiometric maps with June 2016 data will be included, which is another ten (10) figures. RMZ thinks this will give the reader the full picture of how contaminated the area is. AP said that no significant changes to the data has occurred to which RMZ concurred. RMZ said that this is the most comprehensive and consistent approach to addressing AP's comments. RMZ also said that legal is reviewing the post-closure Applicable or Relevant and Appropriate Requirement for the UEP soil cover. RMZ said that the land use controls for the landfill caps will terminate when the underlying soil meets the cleanup criteria, not until UUUE. The UEP is within the residential use restriction area anyway which runs until UUUE. AW suggested a call if any issues are identified. RMZ said that EPA's comment about using specific target levels for EISB and other active treatment areas before MNA is implemented resulted in some text changes. However, Army believes that the Remedial Design (RD) is the best places for the target levels to be developed since more information will be known by the time the RD is done. RMZ said that monitored natural attenuation (MNA) target is a difficult one to set this early and that there is still a contingency remedy for the MNA in place also. AP said that the advantage of having this in the ROD is that the ROD will be used to bid the remedy, which RMZ said that this is her reason for not putting this in the ROD.
- **LHAAP-29** – AW stated that the PP and ROD are being included in the AR.
- **LHAAP-47** – AW stated that the 1<sup>st</sup> Post-Screening Investigation (PSI) Addendum is in the AR and the 2<sup>nd</sup> Addendum to the PSI Report is being included in the next AR update. AW stated that for the 3<sup>rd</sup> Addendum to the PSI Report, the field work was completed on November 8, 2019 with analytical data available in early December such that the December 31, 2019 due date for the draft investigation report likely needs to be moved out. RMZ said that she would prepare a letter with the new schedule for this secondary document.
- **Five Year Review (FYR)** – AW stated that the FYR was ready to post to the AR.
- PS stated that the RAB minutes, calendar and primary documents for each site have been updated and linked on the website. RM asked if the SmartMap is updated. BF stated that the SmartMap pulls data from APTIM's database in real-time.

#### **Schedule Next Managers' Meeting**

The next MMM will be held on Wednesday, December 18, 2019, at 1:00 pm CST via conference call.

Meeting concluded at 2:22 pm CST.

**ACRONYM LIST**

|       |   |
|-------|---|
| AEC   | Army Environmental Command                    |
| AP    | April Palmie                                  |
| APTIM | APTIM Federal Services, LLC                   |
| AR    | Administrative Record                         |
| AS    | Amanda Sherman                                |
| AW    | Aaron Williams                                |
| BF    | Bill Foss                                     |
| Bhate | Bhate Environmental Associates, Inc.          |
| BRAC  | Base Realignment and Closure                  |
| CST   | Central Standard Time                         |
| DERP  | Defense Environmental Restoration Program     |
| EVO   | Emulsified vegetable oil                      |
| FYR   | Five Year Review                              |
| GWTP  | Groundwater Treatment Plant                   |
| KN    | Kim Nemmers                                   |
| LHAAP | Longhorn Army Ammunition Plant                |
| MCL   | Maximum contaminant level                     |
| MMM   | Monthly Managers' Meeting                     |
| MNA   | Monitored natural attenuation                 |
| PBR   | Performance-Based Remediation                 |
| PII   | Personally identifiable information           |
| PP    | Proposed Plan                                 |
| PS    | Praveen Srivastav                             |
| PSI   | Post-Screening Investigation                  |
| PVC   | Polyvinyl chloride                            |
| RAB   | Restoration Advisory Board                    |
| RACR  | Remedial Action Completion Report             |
| RA(O) | Remedial Action – Operation                   |
| RAWP  | Remedial Action Work Plan                     |
| RD    | Remedial Design                               |
| RM    | Rich Mayer                                    |
| RMZ   | Rose M. Zeiler                                |
| ROD   | Record of Decision                            |
| TCE   | Trichloroethene                               |
| TCEQ  | Texas Commission on Environmental Quality     |
| TOC   | Total organic carbon                          |
| USACE | United States Army Corps of Engineers         |
| USEPA | United States Environmental Protection Agency |
| VOC   | Volatile organic compound                     |

**LHAAP Data Validated  
November 2019 MMM**

|                            |   |
|----------------------------|---|
| <b>GWTP Effluent</b>       | <i>Weekly Perchlorate Sampling – October 2019</i><br>Perchlorate (6850)   |
| <b>GWTP Effluent</b>       | <i>Weekly, Bi-Weekly, and Monthly Sampling – October 2019</i><br>Ammonia (350.3)<br>Ortho-Phosphate (365.3)<br>Organic Carbon (415.1)<br>VOC (8260C)<br>Metals (6020A)<br>Hexavalent Chromium (7196A)<br>1,4-Dioxane (8270D-SIM)<br>Anions (9056) |
| <b>GWTP Influent</b>       | <i>Monthly Sampling – October 2019</i><br>Metals (6020A)<br>Perchlorate (6850)<br>Hexavalent Chromium (7196A)   |
| <b>LHAAP Surface Water</b> | <i>Quarterly Perchlorate Sampling - October 2019</i><br>Perchlorate (6850)  |
| <b>LHAAP-16</b>            | <i>October 2018 and September 2019 Baseline Sampling</i><br>VOCs (SW8260)<br>Perchlorate (EPA 6850)<br>DHC (Census count)<br>Dissolved Gases (RSK-175)<br>Alkalinity (SM2320B)<br>Anions (SW9056)<br>TOC (SM5310)<br>Metals (SW6020)              |

## GWTP Weekly/Effluent Perchlorate Sampling -October 2019

| Location ID:<br>Sample Date: | Units | Daily<br>Maximum<br>Conc | (INF pond)<br>MCL | LH18/24-<br>SP650_100119_AIX<br>10/1/19                      | LH18/24-<br>SP650_100819_AIX<br>10/8/19 | LH18/24-<br>SP650_100819_AIX<br>10/8/19 | LH18/24-<br>SP650_101519_AIX<br>10/15/19 | LH18/24-<br>SP650_102219_AIX<br>10/22/19 | LH18/24-<br>SP650_102919_AIX<br>10/29/19 |
|------------------------------|-------|--------------------------|-------------------|--|---|---|--|--|--|
| Location Description         |       |                          |                   | Collected from a spigot on the discharge of effluent TK-650. |   |   |  |  |  |
|                              |       |                          |                   | Weekly   | Monthly EFF                             | Weekly                                  | Weekly                                   | Weekly                                   | Weekly                                   |
| Perchlorate (6850)           |       |                          |                   |  |   |   |  |  |  |
| Perchlorate                  | µg/L  | 589                      | 17                | < 2.0 U  | 6.0                                     | 6.9                                     | < 2.0 U                                  | 1.7 J                                    | < 2.0 U                                  |

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

MCL - maximum contaminant level

## GWTP Weekly Sampling - October 2019

| Location ID:<br>Sample Date:    | Units | Daily<br>Maximum<br>Conc | LH18/24-SP650_100119<br>10/1/19   | LH18/24-SP650_100819<br>10/8/19 | LH18/24-SP650_101519<br>10/15/19 | LH18/24-SP650_102219<br>10/22/19 | LH18/24-SP650_102919<br>10/29/19 |
|---------------------------------|-------|--------------------------|---|---------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Location Description            |       |                          | GWTP—Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly. |                                 |                                  |                                  |                                  |
| <b>Ammonia as N (350.3)</b>     |       |                          |   |                                 |                                  |                                  |                                  |
| Ammonia as N                    | mg/L  | NV                       | 5.2   | 0.32                            | 18                               | 5.9                              | 7.8                              |
| <b>Ortho-Phosphate (365.3)</b>  |       |                          |   |                                 |                                  |                                  |                                  |
| Ortho-Phosphate                 | mg/L  | NV                       | 1.33  | 3.36                            | 2.54                             | 4.06                             | 2.17                             |
| <b>Organic Carbon (SM5310C)</b> |       |                          |   |                                 |                                  |                                  |                                  |
| Total Organic Carbon (TOC)      | mg/L  | NV                       | 1.83  | 2.14                            | 1.3                              | 1.56                             | 4.2                              |

mg/L - milligrams per liter

NV - No Value

## GWTP Bi-Weekly Sampling - October 2019

| Location ID:<br>Sample Date:              | Units | (Bayou) Daily<br>Maximum Conc | (INF pond) MCL | LH18/24-SP650_100119<br>10/1/19   | LH18/24-SP650_101019<br>10/10/19 | LH18/24-SP650_101519<br>10/15/19 | LH18/24-SP650_101719<br>10/17/19 | LH18/24-SP650_102419<br>10/24/19* | LH18/24-SP650_102919<br>10/29/19* |
|---|-------|-------------------------------|----------------|---|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| Location Description                      |       |                               |                | GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly. |                                  |                                  |                                  |                                   |                                   |
| <b>Volatile Organic Compounds (8260C)</b> |       |                               |                |   |                                  |                                  |                                  |                                   |                                   |
| 1,1,1-Trichloroethane                     | µg/L  | 7,230                         | 200            | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| 1,1,2-Trichloroethane                     | µg/L  | 216.9                         | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| 1,1-Dichloroethane                        | µg/L  | 14,032                        | NV             | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 UJ                        | < 0.50 U                          | < 0.50 U                          |
| 1,1-Dichloroethene                        | µg/L  | 253                           | 7              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| 1,2-Dichloroethane                        | µg/L  | 181                           | 5              | 0.37 UB   | < 1.0 U                          | NA                               | <b>1.2</b>                       | <b>1.4</b>                        | <b>1.0</b>                        |
| 1,2-Dichloropropane                       | µg/L  | 5                             | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 UJ                        | < 0.50 U                          | < 0.50 U                          |
| Acetone                                   | µg/L  | 2,395                         | NV             | 5.1 UB  | <b>5.3</b>                       | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Benzene                                   | µg/L  | 181                           | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Carbon tetrachloride                      | µg/L  | 181                           | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Chlorobenzene                             | µg/L  | 47,180                        | 100            | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Chloroform                                | µg/L  | 3,615                         | NV             | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 UJ                        | < 0.50 U                          | < 0.50 U                          |
| cis-1,2-Dichloroethene                    | µg/L  | NV                            | 70             | <b>2.2</b>  | <b>2.4</b>                       | NA                               | <b>12 J</b>                      | <b>21</b>                         | <b>30</b>                         |
| Ethylbenzene                              | µg/L  | 57,025                        | 700            | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| m,p-Xylene                                | µg/L  | 83.6                          | NV             | < 2.0 U   | < 2.0 U                          | NA                               | < 1.0 U                          | < 1.0 U                           | < 1.0 U                           |
| Methylene chloride                        | µg/L  | 1,699                         | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 1.0 U                          | <b>22</b>                         | <b>14</b>                         |
| o-Xylene                                  | µg/L  | 83.6                          | NV             | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Styrene                                   | µg/L  | 5,987                         | 100            | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Tetrachloroethene                         | µg/L  | 180.7                         | 5              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Toluene                                   | µg/L  | 4,189                         | 10             | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | < 0.50 U                          | < 0.50 U                          |
| Trichloroethene                           | µg/L  | 181                           | 5              | <b>0.98 J</b>   | <b>1.2</b>                       | NA                               | <b>1.0</b>                       | <b>1.7</b>                        | <b>5.1</b>                        |
| Vinyl chloride                            | µg/L  | 72                            | 2              | < 1.0 U   | < 1.0 U                          | NA                               | < 0.50 U                         | <b>1.3</b>                        | <b>1.2</b>                        |
| <b>Anions (9056)</b>                      |       |                               |                |   |                                  |                                  |                                  |                                   |                                   |
| Chloride                                  | mg/L  | NV                            | NV             | <b>496</b>  | NA                               | <b>444</b>                       | NA                               | NA                                | <b>548</b>                        |
| Sulfate                                   | mg/L  | NV                            | NV             | <b>101</b>  | NA                               | <b>118</b>                       | NA                               | NA                                | <b>62.6</b>                       |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

NA - not analyzed

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

UB - considered an artifact of blank contamination

\*No exceedances were encountered since discharged to the Bayou.

MCL - maximum contaminant level



## GWTP Monthly Effluent Sampling - October 2019

| Location ID:<br>Sample Date:                       | Units | Daily Maximum<br>Conc | (INF pond) MCL | LH18/24-SP650_100819<br>10/8/19   |
|--|-------|-----------------------|----------------|---|
| Location Description                               |       |                       |                | GWTP – Collected from a spigot on<br>the discharge of effluent TK-650.<br>Sampled monthly |
| <b>Volatile Organic Compounds (8260C)</b>          |       |                       |                |   |
| 1,1,1-Trichloroethane                              | µg/L  | 7,230                 | 200            | < 0.5 U   |
| 1,1,2-Trichloroethane                              | µg/L  | 216.9                 | 5              | < 0.5 U   |
| 1,1-Dichloroethane                                 | µg/L  | 14,032                | NV             | < 0.5 U   |
| 1,1-Dichloroethene                                 | µg/L  | 253                   | 7              | < 0.5 U   |
| 1,2-Dichloroethane                                 | µg/L  | 181                   | 5              | < 0.5 U   |
| 1,2-Dichloropropane                                | µg/L  | 5                     | 5              | < 0.5 U   |
| Acetone  | µg/L  | 2,395                 | NV             | 44 UB   |
| Benzene  | µg/L  | 181                   | 5              | < 0.5 U   |
| Carbon tetrachloride                               | µg/L  | 181                   | 5              | < 0.5 U   |
| Chlorobenzene                                      | µg/L  | 47,180                | 100            | < 0.5 U   |
| Chloroform   | µg/L  | 3,615                 | NV             | < 0.5 U   |
| cis-1,2-Dichloroethene                             | µg/L  | NV                    | 70             | <b>1.8</b>  |
| Ethylbenzene                                       | µg/L  | 57,025                | 700            | < 0.5 U   |
| m,p-Xylene   | µg/L  | 83.6                  | NV             | < 1.0 U   |
| Methylene chloride                                 | µg/L  | 1,699                 | 5              | < 1.0 U   |
| o-Xylene   | µg/L  | 83.6                  | NV             | < 0.5 U   |
| Styrene  | µg/L  | 5,987                 | 100            | < 0.5 U   |
| Tetrachloroethene                                  | µg/L  | 180.7                 | 5              | < 0.5 U   |
| Toluene  | µg/L  | 4,189                 | 10             | < 0.5 U   |
| Trichloroethene                                    | µg/L  | 181                   | 5              | <b>0.80 J</b>   |
| Vinyl chloride                                     | µg/L  | 72                    | 2              | < 0.5 U   |
| <b>Metals (6020A)</b>                              |       |                       |                |   |
| Barium   | mg/L  | 2                     | 2              | <b>0.0770</b>   |
| Lead   | mg/L  | 0.0046                | 0.015          | < 0.00100 U   |
| Selenium   | mg/L  | 0.012                 | 0.05           | < 0.00250 U   |
| Silver   | mg/L  | 0.003                 | 0.1            | < 0.000500 U  |
| <b>Hexavalent Chromium (7196A)</b>                 |       |                       |                |   |
| Hexavalent Chromium                                | mg/L  | 0.1244                | NA             | <b>0.00900 J</b>  |
| <b>Semi-Volatile Organic Compounds (8270D SIM)</b> |       |                       |                |   |
| 1,4-Dioxane  | µg/L  | 134.2                 | NA             | <b>23</b>   |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

UB - considered an artifact of blank contamination

MCL - maximum contaminant level

### GWTP Monthly Influent Sampling - October 2019

|                                    |       |   |
|------------------------------------|-------|---|
| Location ID:<br>Sample Date:       | Units | LH18/24-SP140_100819<br>10/8/19   |
| Location Description               |       | GWTP – Collected from a spigot on the<br>influent to TK-140. Sampled Monthly. |
| <b>Metals (6020A)</b>              |       |   |
| Selenium                           | mg/L  | < 0.00250 U   |
| Silver                             | mg/L  | < 0.000500 U  |
| <b>Hexavalent Chromium (7196A)</b> |       |   |
| Hexavalent Chromium                | mg/L  | < 0.0100 U  |
| <b>Perchlorate (6850)</b>          |       |   |
| Perchlorate                        | µg/L  | <b>12,000</b>   |

mg/L - milligrams per liter

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

## LHAAP-Quarterly Surface Water Sampling - October 2019

| Location ID:<br>Sample Date: | Units | PCL | HBW7-103119<br>10/31/19 | HBW10_103119<br>10/31/19 | HBW1_103119<br>10/31/19 | HBW1_103119_a<br>10/31/19 | GPW1_103119<br>10/31/19 | GPW3_103119<br>10/31/19 |
|------------------------------|-------|-----|-------------------------|--------------------------|-------------------------|---------------------------|-------------------------|-------------------------|
| Perchlorate (6850)           |       |     | Harrison Bayou          |                          |                         |                           | Goose Prairie Creek     |                         |
| Perchlorate                  | µg/L  | 17  | 1.6 J                   | < 2.0 U                  | < 2.0 U                 | < 2.0 U                   | < 2.0 U                 | < 2.0 U                 |

PCL – Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

µg/L - micrograms per liter

U - Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

Exceeded PCL screening criteria

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16EW02                             |          |               |          | 16EW05                                  |          | 16EW06                                  |          |               |          | 16EW07                                  |          | 16EW08                                  |          | 16EW11                                 |          | 16EW12B                                |          |
|---|--------|-------------------|------------------------------------|----------|---------------|----------|---|----------|---|----------|---------------|----------|---|----------|---|----------|--|----------|--|----------|
|   |        |                   | 16EW02-181009                      |          | 16EW02-190918 |          | 16EW05-181011                           |          | 16EW06-181009                           |          | 16EW06-190918 |          | 16EW07-181013                           |          | 16EW08-181013                           |          | 16EW11-181013                          |          | 16EW12B-181013                         |          |
|   |        |                   | 10/9/2018                          |          | 9/18/2019     |          | 10/11/2018                              |          | 10/9/2018                               |          | 9/18/2019     |          | 10/13/2018                              |          | 10/13/2018                              |          | 10/13/2018                             |          | 10/13/2018                             |          |
|   |        |                   | Shallow; Inside Mid-Plume ISB Area |          |               |          | Intermediate; Inside Mid-plume ISB Area |          | Intermediate; Inside Mid-plume ISB Area |          |               |          | Intermediate; Inside Mid-plume ISB Area |          | Intermediate; Inside Mid-plume ISB Area |          | Shallow; Within Landfill Biobarrier #2 |          | Shallow; Within Landfill Biobarrier #2 |          |
| Parameter   | Units  | MCL/PCL           | Result                             | Val Qual | Result        | Val Qual | Result                                  | Val Qual | Result                                  | Val Qual | Result        | Val Qual | Result                                  | Val Qual | Result                                  | Val Qual | Result                                 | Val Qual | Result                                 | Val Qual |
| VOCs  |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | 100                                |          | 110           |          |   |          | 25                                      |          | 22            | J        |   |          |   |          |  |          |  |          |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 25                               | U        | 51            |          |   |          | 4.6                                     | J        | < 12          | U        |   |          |   |          |  |          |  |          |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 16000                              |          | 25000         |          |   |          | 3700                                    |          | 3700          |          |   |          |   |          |  |          |  |          |
| Methylene chloride  | µg/L   | 5                 | < 50                               | U        | < 25          | U        |   |          | < 5                                     | U        | < 25          | U        |   |          |   |          |  |          |  |          |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 25                               | U        | < 12          | U        |   |          | < 2.5                                   | U        | < 12          | U        |   |          |   |          |  |          |  |          |
| Trichloroethene   | µg/L   | 5                 | 24000                              |          | 42000         |          |   |          | 5500                                    |          | 6500          |          |   |          |   |          |  |          |  |          |
| Vinyl chloride  | µg/L   | 2                 | 470                                |          | 650           |          |   |          | 240                                     |          | 190           |          |   |          |   |          |  |          |  |          |
| PERCHLORATE   |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2                                | U        | < 2           | U        |   |          | < 2                                     | U        | 42            |          |   |          |   |          |  |          |  |          |
| DHC   |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Dehalococcoides   | CEQ/ML | NV                | 0.2                                | J        |               |          |   |          | 1.7                                     |          |               |          |   |          |   |          |  |          |  |          |
| DISSOLVED GASES   |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Ethane  | µg/L   | NV                | 1.16                               |          |               |          |   |          | 0.31                                    | J        |               |          |   |          |   |          |  |          |  |          |
| Ethylene  | µg/L   | NV                | 8.81                               |          |               |          |   |          | 3.76                                    |          |               |          |   |          |   |          |  |          |  |          |
| Methane   | µg/L   | NV                | 33.6                               |          |               |          |   |          | 8.39                                    |          |               |          |   |          |   |          |  |          |  |          |
| GENERAL CHEMISTRY   |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Alkalinity  | mg/L   | NV                | 438                                |          |               |          |   |          | 438                                     |          |               |          |   |          |   |          |  |          |  |          |
| Bromide   | mg/L   | NV                | 2.66                               |          |               |          | 3.1                                     |          | 3.38                                    |          |               |          | 2.14                                    |          | 1.11                                    |          | 4.68                                   |          | 3.82                                   |          |
| Nitrate   | µg/L   | 10000             | < 100                              | U        |               |          |   |          | < 0.2                                   | U        |               |          |   |          |   |          |  |          |  |          |
| Sulfate   | mg/L   | NV                | 2130                               |          |               |          |   |          | 6120                                    |          |               |          |   |          |   |          |  |          |  |          |
| Total organic carbon  | mg/L   | NV                | 10.3                               |          |               |          |   |          | 31                                      |          |               |          |   |          |   |          |  |          |  |          |
| METALS  |        |                   |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Arsenic   | µg/L   | 10                |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Chromium  | µg/L   | 100               |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |
| Thallium  | µg/L   | 2                 |                                    |          |               |          |   |          |   |          |               |          |   |          |   |          |  |          |  |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16EW13                                    |          | 16EW14B                                   |          | 16EW15                                    |          | 16SW01                             |          |               |          | 16SW02                             |          | 16SW03                              |          | 16WW12                                  |          |               |          |
|---|--------|-------------------|---|----------|---|----------|---|----------|------------------------------------|----------|---------------|----------|------------------------------------|----------|-------------------------------------|----------|---|----------|---------------|----------|
|   |        |                   | 16EW13-181013                             |          | 16EW14B-181013                            |          | 16EW15-181013                             |          | 16SW01-181011-FD                   |          | 16SW01-181011 |          | 16SW02-181011                      |          | 16SW03-181011                       |          | 16WW12-181012                           |          | 16WW12-190918 |          |
|   |        |                   | 10/13/2018                                |          | 10/13/2018                                |          | 10/13/2018                                |          | 10/11/2018                         |          | 10/11/2018    |          | 10/11/2018                         |          | 10/11/2018                          |          | 10/12/2018                              |          | 9/18/2019     |          |
|   |        |                   | Shallow; Within Landfill<br>Biobarrier #2 |          | Shallow; Within Landfill<br>Biobarrier #2 |          | Shallow; Within Landfill<br>Biobarrier #2 |          | Surface Water; Downstream Location |          |               |          | Surface Water; Adjacent<br>to Site |          | Surface Water;<br>Upstream Location |          | Shallow; Upgradient to Bayou Biobarrier |          |               |          |
| Parameter   | Units  | MCL/PCL           | Result                                    | Val Qual | Result                                    | Val Qual | Result                                    | Val Qual | Result                             | Val Qual | Result        | Val Qual | Result                             | Val Qual | Result                              | Val Qual | Result                                  | Val Qual | Result        | Val Qual |
| VOCs  |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| 1,1-Dichloroethene  | µg/L   | 7                 |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | < 5                                     | U        | 4.9           | J        |
| 1,2-Dichloroethane  | µg/L   | 5                 |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | 16                                      |          | 9.2           |          |
| cis-1,2-Dichloroethene  | µg/L   | 70                |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | 86                                      |          | 52            |          |
| Methylene chloride  | µg/L   | 5                 |   |          |   |          |   |          | < 1                                | U        | < 1           | U        | < 1                                | U        | < 1                                 | U        | < 10                                    | U        | < 5           | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | < 5                                     | U        | < 2.5         | U        |
| Trichloroethene   | µg/L   | 5                 |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | 4100                                    |          | 2100          |          |
| Vinyl chloride  | µg/L   | 2                 |   |          |   |          |   |          | < 0.5                              | U        | < 0.5         | U        | < 0.5                              | U        | < 0.5                               | U        | 12                                      |          | 5.5           |          |
| PERCHLORATE   |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   |   |          |   |          |   |          | < 2                                | U        | < 2           | U        | < 2                                | U        | < 2                                 | U        | 12                                      |          | 120           |          |
| DHC   |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Dehalococcoides   | CEQ/ML | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| DISSOLVED GASES   |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Ethane  | µg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Ethylene  | µg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Methane   | µg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| GENERAL CHEMISTRY   |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Alkalinity  | mg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Bromide   | mg/L   | NV                | 2.91                                      |          | 1.4                                       |          | 1.86                                      |          |                                    |          |               |          |                                    |          |                                     |          | 3.9                                     |          |               |          |
| Nitrate   | µg/L   | 10000             |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Sulfate   | mg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Total organic carbon  | mg/L   | NV                |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| METALS  |        |                   |   |          |   |          |   |          |                                    |          |               |          |                                    |          |                                     |          |   |          |               |          |
| Arsenic   | µg/L   | 10                |   |          |   |          |   |          | 2.12                               |          | 2.04          |          | 1.98                               | J        | 1.94                                | J        |   |          |               |          |
| Chromium  | µg/L   | 100               |   |          |   |          |   |          | 0.515                              | J        | 0.499         | J        | < 1                                | U        | < 1                                 | U        |   |          |               |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |   |          |   |          |   |          | 586                                |          | 545           |          | 485                                |          | 360                                 |          |   |          |               |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |   |          |   |          |   |          | 7.86                               |          | 7.56          |          | 7.25                               |          | 6.68                                |          |   |          |               |          |
| Thallium  | µg/L   | 2                 |   |          |   |          |   |          | < 1                                | U        | 0.418         | J        | < 1                                | U        | < 1                                 | U        |   |          |               |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

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.

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW13                                 |          |               |          | 16WW14   |          |               |          | 16WW16   |          |               |          | 16WW21  |          | 16WW22                                  |          |               |          |
|---|--------|-------------------|--|----------|---------------|----------|--|----------|---------------|----------|--|----------|---------------|----------|---|----------|---|----------|---------------|----------|
|   |        |                   | 16WW13-181012                          |          | 16WW13-190918 |          | 16WW14-181010                                    |          | 16WW14-190916 |          | 16WW16-181010                                    |          | 16WW16-190916 |          | 16WW21-181012                                     |          | 16WW22-181010                           |          | 16WW22-190917 |          |
|   |        |                   | 10/12/2018                             |          | 9/18/2019     |          | 10/10/2018                                       |          | 9/16/2019     |          | 10/10/2018                                       |          | 9/16/2019     |          | 10/12/2018  |          | 10/10/2018                              |          | 9/17/2019     |          |
|   |        |                   | Intermediate; Downgradient of Landfill |          |               |          | Shallow; Upgradient to Landfill<br>Biobarrier #3 |          |               |          | Shallow; Upgradient to Landfill<br>Biobarrier #2 |          |               |          | Shallow; Downgradient<br>of Mid-Plume<br>ISB Area |          | Shallow; Upgradient to Bayou Biobarrier |          |               |          |
| Parameter   | Units  | MCL/PCL           | Result                                 | Val Qual | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual | Result  | Val Qual | Result                                  | Val Qual | Result        | Val Qual |
| VOCs  |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | < 5                                    | U        | 0.7           | J        | < 0.5  | U        | < 0.5         | U        | < 25   | U        | 25            |          | < 0.5   | U        | 1.9                                     |          | < 0.5         | U        |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 5                                    | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 25   | U        | 19            | J        | < 0.5   | U        | < 0.5                                   | U        | < 0.5         | U        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 1700                                   |          | 210           |          | 2.6  |          | 0.79          | J        | 8500   |          | 6600          |          | < 0.5   | U        | 19                                      |          | 2.7           |          |
| Methylene chloride  | µg/L   | 5                 | < 10                                   | U        | < 1           | U        | < 1  | U        | < 1           | U        | < 50   | U        | < 25          | U        | < 1   | U        | < 1                                     | U        | < 1           | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 5                                    | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 25   | U        | < 12          | U        | < 0.5   | U        | < 0.5                                   | U        | < 0.5         | U        |
| Trichloroethene   | µg/L   | 5                 | 4400                                   |          | 630           |          | 42   |          | 25            |          | 21000  |          | 13000         |          | < 0.5   | U        | 150                                     |          | 34            |          |
| Vinyl chloride  | µg/L   | 2                 | 51                                     |          | 5.6           |          | 1.1  |          | < 0.5         | U        | 330  |          | 220           |          | < 0.5   | U        | 4.5                                     |          | 0.44          | J        |
| PERCHLORATE   |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2                                    | U        | < 2           | U        | < 2  | U        | < 2           | U        | 420  |          | 460           |          | < 2   | U        | 5.5                                     |          | < 2           | U        |
| DHC   |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Dehalococcoides   | CEQ/ML | NV                |  |          |               |          |  |          |               |          | 0.5  | U        |               |          |   |          | 5.2                                     |          |               |          |
| DISSOLVED GASES   |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Ethane  | µg/L   | NV                |  |          |               |          |  |          |               |          | 2.31   |          |               |          |   |          | < 1                                     | U        |               |          |
| Ethylene  | µg/L   | NV                |  |          |               |          |  |          |               |          | 4.98   |          |               |          |   |          | 1.56                                    |          |               |          |
| Methane   | µg/L   | NV                |  |          |               |          |  |          |               |          | 403  |          |               |          |   |          | 2.46                                    |          |               |          |
| GENERAL CHEMISTRY   |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Alkalinity  | mg/L   | NV                |  |          |               |          |  |          |               |          | 362  |          |               |          |   |          | 239                                     |          |               |          |
| Bromide   | mg/L   | NV                | 0.929                                  |          |               |          |  |          |               |          | 4.69   |          |               |          | 0.218   |          | 4.46                                    |          |               |          |
| Nitrate   | µg/L   | 10000             |  |          |               |          |  |          |               |          | < 100  | U        |               |          |   |          | < 0.1                                   | U        |               |          |
| Sulfate   | mg/L   | NV                |  |          |               |          |  |          |               |          | 722  |          |               |          |   |          | 772                                     |          |               |          |
| Total organic carbon  | mg/L   | NV                |  |          |               |          |  |          |               |          | 4.34   |          |               |          |   |          | 2.62                                    |          |               |          |
| METALS  |        |                   |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Arsenic   | µg/L   | 10                |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Chromium  | µg/L   | 100               |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |
| Thallium  | µg/L   | 2                 |  |          |               |          |  |          |               |          |  |          |               |          |   |          |   |          |               |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW23                                 |          |               |          | 16WW24                                    |          |                  |          |               |          | 16WW25   |          |               |          |                  |          |
|---|--------|-------------------|--|----------|---------------|----------|---|----------|------------------|----------|---------------|----------|--|----------|---------------|----------|------------------|----------|
|   |        |                   | 16WW23-181012                          |          | 16WW23-190917 |          | 16WW24-181009                             |          | 16WW24-181009-FD |          | 16WW24-190917 |          | 16WW25-181009  |          | 16WW25-190919 |          | 16WW25-190919-FD |          |
|   |        |                   | 10/12/2018                             |          | 9/17/2019     |          | 10/9/2018                                 |          | 10/9/2018        |          | 9/17/2019     |          | 10/9/2018  |          | 9/19/2019     |          | 9/19/2019        |          |
|   |        |                   | Intermediate; Downgradient of Landfill |          |               |          | Shallow; Cross-gradient to South of Plume |          |                  |          |               |          | Intermediate; Upgradient of Mid-Plume ISB Area / Downgradient of Landfill<br>Biobarrier #1 |          |               |          |                  |          |
| Parameter   | Units  | MCL/PCL           | Result                                 | Val Qual | Result        | Val Qual | Result                                    | Val Qual | Result           | Val Qual | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual | Result           | Val Qual |
| VOCs  |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | < 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-Dichloroethane  | µg/L   | 5                 | < 0.5                                  | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5            | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 0.5            | U        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | < 0.5                                  | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5            | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 0.5            | U        |
| Methylene chloride  | µg/L   | 5                 | < 1                                    | U        | < 1           | U        | < 1                                       | U        | < 1              | U        | < 1           | U        | < 1  | U        | < 1           | U        | < 1              | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 0.5                                  | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5            | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 0.5            | U        |
| Trichloroethene   | µg/L   | 5                 | < 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  | µg/L   | 2                 | < 0.5                                  | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5            | U        | < 0.5         | U        | < 0.5  | U        | < 0.5         | U        | < 0.5            | U        |
| PERCHLORATE   |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2                                    | U        | < 2           | U        | < 2                                       | U        | < 2              | U        | < 2           | U        | < 2  | U        | < 2           | U        | < 2              | U        |
| DHC   |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Dehalococcoides   | CEQ/ML | NV                |  |          |               |          | 1.6                                       |          |                  |          |               |          | 0.5  | U        |               |          |                  |          |
| DISSOLVED GASES   |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Ethane  | µg/L   | NV                |  |          |               |          | 0.256                                     | J        | 0.555            | J        |               |          | 0.316  | J        |               |          |                  |          |
| Ethylene  | µg/L   | NV                |  |          |               |          | 1.39                                      | J        | 1.24             |          |               |          | 0.954  | J        |               |          |                  |          |
| Methane   | µg/L   | NV                |  |          |               |          | 1.65                                      |          | 3.27             |          |               |          | 13.7   |          |               |          |                  |          |
| GENERAL CHEMISTRY   |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Alkalinity  | mg/L   | NV                |  |          |               |          | < 5                                       | U        | < 5              | U        |               |          | 69   |          |               |          |                  |          |
| Bromide   | mg/L   | NV                |  |          |               |          | 1.26                                      |          | 1.32             |          |               |          | 2.86   |          |               |          |                  |          |
| Nitrate   | µg/L   | 10000             |  |          |               |          | < 100                                     | U        | < 0.1            | U        |               |          | < 100  | U        |               |          |                  |          |
| Sulfate   | mg/L   | NV                |  |          |               |          | 905                                       |          | 898              |          |               |          | 5710   |          |               |          |                  |          |
| Total organic carbon  | mg/L   | NV                |  |          |               |          | 2.76                                      |          | 2.65             |          |               |          | 23.8   |          |               |          |                  |          |
| METALS  |        |                   |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Arsenic   | µg/L   | 10                |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Chromium  | µg/L   | 100               |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |
| Thallium  | µg/L   | 2                 |  |          |               |          |   |          |                  |          |               |          |  |          |               |          |                  |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

<sup>b</sup> - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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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.

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW26   |          |               |          |                  |          | 16WW27   |          |               |          | 16WW29  |          |               |          | 16WW30   |          |               |          |
|---|--------|-------------------|--|----------|---------------|----------|------------------|----------|--|----------|---------------|----------|---|----------|---------------|----------|--|----------|---------------|----------|
|   |        |                   | 16WW26-181009                                      |          | 16WW26-190917 |          | 16WW26-190917-FD |          | 16WW27-181012  |          | 16WW27-190917 |          | 16WW29-181015                                       |          | 16WW29-190918 |          | 16WW30-181012                                  |          | 16WW30-190918 |          |
|   |        |                   | 10/9/2018  |          | 9/17/2019     |          | 9/18/2019        |          | 10/12/2018   |          | 9/17/2019     |          | 10/15/2018  |          | 9/18/2019     |          | 10/12/2018                                     |          | 9/18/2019     |          |
|   |        |                   | Shallow; Downgradient to Landfill<br>Biobarrier #1 |          |               |          |                  |          | Intermediate; Downgradient Outside of<br>Contaminated Area |          |               |          | Intermediate; Downgradient of Mid-Plume<br>ISB Area |          |               |          | Shallow; Downgradient of Mid-Plume<br>ISB Area |          |               |          |
| Parameter   | Units  | MCL/PCL           | Result   | Val Qual | Result        | Val Qual | Result           | Val Qual | Result   | Val Qual | Result        | Val Qual | Result  | Val Qual | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual |
| VOCs  |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | < 2.5  | U        | 1.4           |          | 1.6              |          | < 0.5  | U        | < 0.5         | U        | < 0.5   | U        | < 0.5         | U        | < 0.5  | U        | 0.82          | J        |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 2.5  | 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        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 290  |          | 35            |          | 36               |          | < 0.5  | U        | < 0.5         | U        | 8.4   |          | < 0.5         | U        | < 0.5  | U        | 79            |          |
| Methylene chloride  | µg/L   | 5                 | < 5  | U        | < 1           | U        | < 1              | U        | < 1  | U        | < 1           | U        | < 1   | U        | < 1           | U        | < 1  | U        | < 1           | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 2.5  | 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        |
| Trichloroethene   | µg/L   | 5                 | 2400   |          | 380           |          | 440              |          | < 0.5  | U        | < 0.5         | U        | 3.3   |          | 2.7           |          | 1.8  |          | 360           |          |
| Vinyl chloride  | µg/L   | 2                 | 5  | J        | < 0.5         | U        | < 0.5            | U        | < 0.5  | U        | < 0.5         | U        | < 0.5   | U        | < 0.5         | U        | < 0.5  | U        | 0.41          | J        |
| PERCHLORATE   |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2  | U        | < 2           | U        | < 2              | U        | < 2  | U        | < 2           | U        | < 2   |          | < 2           | U        | < 2  | U        | < 2           | U        |
| DHC   |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Dehalococcoides   | CEQ/ML | NV                | 0.3  | J        |               |          |                  |          |  |          |               |          | 0.5   |          |               |          |  |          |               |          |
| DISSOLVED GASES   |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Ethane  | µg/L   | NV                | 0.591  | J        |               |          |                  |          |  |          |               |          | < 1   | U        |               |          |  |          |               |          |
| Ethylene  | µg/L   | NV                | 2.59   |          |               |          |                  |          |  |          |               |          | 1.87  |          |               |          |  |          |               |          |
| Methane   | µg/L   | NV                | 10.5   |          |               |          |                  |          |  |          |               |          | 2.41  |          |               |          |  |          |               |          |
| GENERAL CHEMISTRY   |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Alkalinity  | mg/L   | NV                | 12   |          |               |          |                  |          |  |          |               |          | 45.9  |          |               |          |  |          |               |          |
| Bromide   | mg/L   | NV                | < 0.1  | U        |               |          |                  |          |  |          |               |          | 0.218   |          |               |          | 3.22   |          |               |          |
| Nitrate   | µg/L   | 10000             | < 0.1  | U        |               |          |                  |          |  |          |               |          | < 100   | U        |               |          |  |          |               |          |
| Sulfate   | mg/L   | NV                | 1170   |          |               |          |                  |          |  |          |               |          | 99.2  |          |               |          |  |          |               |          |
| Total organic carbon  | mg/L   | NV                | 5.03   |          |               |          |                  |          |  |          |               |          | 1.8   |          |               |          |  |          |               |          |
| METALS  |        |                   |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Arsenic   | µg/L   | 10                |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Chromium  | µg/L   | 100               |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |
| Thallium  | µg/L   | 2                 |  |          |               |          |                  |          |  |          |               |          |   |          |               |          |  |          |               |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

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VOCs - volatile organic compounds

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LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW31   |          |                  |          | 16WW32  |          | 16WW33   |          | 16WW34  |          | 16WW35  |          |               |          | 16WW36  |          |               |          |
|---|--------|-------------------|--|----------|------------------|----------|---|----------|--|----------|---|----------|---|----------|---------------|----------|---|----------|---------------|----------|
|   |        |                   | 16WW31-181010  |          | 16WW31-181010-FD |          | 16WW32-181011                                       |          | 16WW33-181010  |          | 16WW34-181010                                       |          | 16WW35-181010   |          | 16WW35-190918 |          | 16WW36-181009                                   |          | 16WW36-190916 |          |
|   |        |                   | 10/10/2018   |          | 10/10/2018       |          | 10/11/2018  |          | 10/10/2018   |          | 10/10/2018  |          | 10/10/2018  |          | 9/18/2019     |          | 10/9/2018                                       |          | 9/16/2019     |          |
|   |        |                   | Intermediate; Cross-gradient Outside of Containment Area |          |                  |          | Shallow; Cross-gradient Outside of Containment Area |          | Intermediate; Cross-gradient Outside of Containment Area |          | Shallow; Cross-gradient Outside of Containment Area |          | Intermediate; Upgradient of Mid-Plume ISB Area / Downgradient of Landfill Biobarrier #2 |          |               |          | Shallow; Downgradient to Landfill Biobarrier #2 |          |               |          |
| Parameter   | Units  | MCL/PCL           | Result   | Val Qual | Result           | Val Qual | Result  | Val Qual | Result   | Val Qual | Result  | Val Qual | Result  | Val Qual | Result        | Val Qual | Result  | Val Qual | Result        | Val Qual |
| VOCs  |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | 190   |          | 120           |          | 450   |          | 190           |          |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 25  | U        | < 12          | U        | 34  | J        | 13            | J        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | 19000   |          | 8800          |          | 66000   |          | 19000         |          |
| Methylene chloride  | µg/L   | 5                 | < 1  | U        | < 1              | U        | < 1   | U        | < 1  | U        | < 1   | U        | < 50  | U        | < 25          | U        | < 50  | U        | < 25          | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 25  | U        | < 12          | U        | < 25  | U        | < 12          | U        |
| Trichloroethene   | µg/L   | 5                 | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | 21000   |          | 13000         |          | 22000   |          | 15000         |          |
| Vinyl chloride  | µg/L   | 2                 | < 0.5  | U        | < 0.5            | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | 170   |          | 75            |          | 610   |          | 230           |          |
| PERCHLORATE   |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2  | U        | < 2              | U        | < 2   |          | < 2  | U        | < 2   | U        | 420   |          | 410           |          | < 2   | U        | < 2           | U        |
| DHC   |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Dehalococcoides   | CEQ/ML | NV                |  |          |                  |          |   |          |  |          |   |          | 33.9  |          |               |          | 202   |          |               |          |
| DISSOLVED GASES   |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Ethane  | µg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 0.644   | J        |               |          | < 1   | U        |               |          |
| Ethylene  | µg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 4.38  |          |               |          | 12.3  |          |               |          |
| Methane   | µg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 55  |          |               |          | 175   |          |               |          |
| GENERAL CHEMISTRY   |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Alkalinity  | mg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 969   |          |               |          | 613   |          |               |          |
| Bromide   | mg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | < 0.2   | U        |               |          | 2.7   |          |               |          |
| Nitrate   | µg/L   | 10000             |  |          |                  |          |   |          |  |          |   |          | < 200   | U        |               |          | < 0.2   | U        |               |          |
| Sulfate   | mg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 8400  |          |               |          | 6290  |          |               |          |
| Total organic carbon  | mg/L   | NV                |  |          |                  |          |   |          |  |          |   |          | 44  |          |               |          | 33  |          |               |          |
| METALS  |        |                   |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Arsenic   | µg/L   | 10                |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Chromium  | µg/L   | 100               |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |
| Thallium  | µg/L   | 2                 |  |          |                  |          |   |          |  |          |   |          |   |          |               |          |   |          |               |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

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µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW37  |          | 16WW38  |          | 16WW39                                      |          |               |          | 16WW40                                    |          |                  |          |               |          |
|---|--------|-------------------|---|----------|---|----------|---|----------|---------------|----------|---|----------|------------------|----------|---------------|----------|
|   |        |                   | 16WW37-181010   |          | 16WW38-181010                                 |          | 16WW39-181010                               |          | 16WW39-190917 |          | 16WW40-181012                             |          | 16WW40-181012-FD |          | 16WW40-190917 |          |
|   |        |                   | 10/10/2018  |          | 10/10/2018                                    |          | 10/10/2018                                  |          | 9/17/2019     |          | 10/12/2018                                |          | 10/12/2018       |          | 9/17/2019     |          |
|   |        |                   | Intermediate; Downgradient of Landfill / Upgradient of Landfill Biobarrier #2 |          | Shallow; Upgradient to Landfill Biobarrier #2 |          | Shallow; Downgradient of Mid-Plume ISB Area |          |               |          | Shallow; Downgradient to Bayou Biobarrier |          |                  |          |               |          |
| Parameter   | Units  | MCL/PCL           | Result  | Val Qual | Result  | Val Qual | Result                                      | Val Qual | Result        | Val Qual | Result                                    | Val Qual | Result           | Val Qual | Result        | Val Qual |
| VOCs  |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | < 0.5   | U        | 21  |          | < 5   | U        | 2.7           |          | 3.5                                       |          | 3.5              |          | 3.7           |          |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 0.5   | U        | < 5   | U        | < 5   | U        | 2             |          | 3.8                                       |          | 3.8              |          | 3.8           |          |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 5.2   |          | 240   |          | 220   |          | 110           |          | 220                                       |          | 240              |          | 130           |          |
| Methylene chloride  | µg/L   | 5                 | < 1   | U        | < 10  | U        | < 10  | U        | < 1           | U        | < 1                                       | U        | < 1              | U        | < 1           | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 0.5   | U        | < 5   | U        | < 5   | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5            | U        | < 0.5         | U        |
| Trichloroethene   | µg/L   | 5                 | 84  |          | 4400  |          | 3900  |          | 1200          |          | 660                                       |          | 640              |          | 740           |          |
| Vinyl chloride  | µg/L   | 2                 | < 0.5   | U        | 160   |          | 15  |          | 7.1           |          | 4.5                                       |          | 4.2              |          | 3             |          |
| PERCHLORATE   |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2   | U        | < 2   | U        | 120   |          | 130           |          | < 2                                       | U        | < 2              | U        | < 2           | U        |
| DHC   |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Dehalococcoides   | CEQ/ML | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| DISSOLVED GASES   |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Ethane  | µg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Ethylene  | µg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Methane   | µg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| GENERAL CHEMISTRY   |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Alkalinity  | mg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Bromide   | mg/L   | NV                |   |          |   |          | 4.2   |          |               |          | 5.57                                      |          | 5.72             |          |               |          |
| Nitrate   | µg/L   | 10000             |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Sulfate   | mg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Total organic carbon  | mg/L   | NV                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| METALS  |        |                   |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Arsenic   | µg/L   | 10                |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Chromium  | µg/L   | 100               |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |
| Thallium  | µg/L   | 2                 |   |          |   |          |   |          |               |          |   |          |                  |          |               |          |

Notes:

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MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW41   |          |               |          | 16WW42   |          |               |          | 16WW43                                    |          |               |          | 16WW44              |          | 16WW45                      |          | 16WW46   |          |
|---|--------|-------------------|--|----------|---------------|----------|--|----------|---------------|----------|---|----------|---------------|----------|---------------------|----------|-----------------------------|----------|--|----------|
|   |        |                   | 16WW41-181009  |          | 16WW41-190917 |          | 16WW42-181012                                      |          | 16WW42-190916 |          | 16WW43-181009                             |          | 16WW43-190917 |          | 16WW44-181010       |          | 16WW45-181010               |          | 16WW46-181012  |          |
|   |        |                   | 10/9/2018  |          | 9/17/2019     |          | 10/12/2018   |          | 9/16/2019     |          | 10/9/2018                                 |          | 9/17/2019     |          | 10/10/2018          |          | 10/10/2018                  |          | 10/12/2018   |          |
|   |        |                   | Intermediate; Downgradient of Mid- Plume<br>ISB Area |          |               |          | Shallow; Downgradient to Landfill<br>Biobarrier #1 |          |               |          | Shallow; Cross-gradient to South of Plume |          |               |          | Shallow; Background |          | Intermediate;<br>Background |          | Shallow; Downgradient<br>Outside of<br>Contaminated Area |          |
| Parameter   | Units  | MCL/PCL           | Result   | Val Qual | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual | Result                                    | Val Qual | Result        | Val Qual | Result              | Val Qual | Result                      | Val Qual | Result   | Val Qual |
| VOCs  |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | 17   |          | 11            |          | < 0.5  | U        | < 0.5         | U        | < 0.5                                     | U        | < 0.5         | U        | < 0.5               | U        | < 0.5                       | U        | < 0.5  | U        |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 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        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 1200   |          | 1300          |          | 42   |          | 240           |          | < 0.5                                     | U        | < 0.5         | U        | < 0.5               | U        | < 0.5                       | U        | < 0.5  | U        |
| Methylene chloride  | µg/L   | 5                 | < 10   | U        | < 10          | U        | < 1  | U        | < 1           | U        | < 1                                       | U        | < 1           | U        | < 1                 | U        | < 1                         | U        | < 1  | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 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        |
| Trichloroethene   | µg/L   | 5                 | 9800   |          | 3900          |          | 6  |          | 29            |          | < 0.5                                     | U        | < 0.5         | U        | < 0.5               | U        | < 0.5                       | U        | 3  |          |
| Vinyl chloride  | µg/L   | 2                 | 110  |          | 80            |          | < 0.5  | U        | 1.1           |          | < 0.5                                     | U        | < 0.5         | U        | < 0.5               | U        | < 0.5                       | U        | < 0.5  | U        |
| PERCHLORATE   |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | 60   |          | < 2           | U        | < 2  | U        | < 2           | U        | < 2                                       | U        | < 2           | U        | < 2                 | U        | < 2                         | U        | < 2  | U        |
| DHC   |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Dehalococcoides   | CEQ/ML | NV                | 0.5  | U        |               |          |  |          |               |          | 2.1                                       |          |               |          |                     |          |                             |          |  |          |
| DISSOLVED GASES   |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Ethane  | µg/L   | NV                | 0.281  | J        |               |          |  |          |               |          | < 1                                       | U        |               |          |                     |          |                             |          |  |          |
| Ethylene  | µg/L   | NV                | 3.04   |          |               |          |  |          |               |          | 2.28                                      |          |               |          |                     |          |                             |          |  |          |
| Methane   | µg/L   | NV                | 6.55   |          |               |          |  |          |               |          | 133                                       |          |               |          |                     |          |                             |          |  |          |
| GENERAL CHEMISTRY   |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Alkalinity  | mg/L   | NV                | 951  |          |               |          |  |          |               |          | 104                                       |          |               |          |                     |          |                             |          |  |          |
| Bromide   | mg/L   | NV                | 3.35   |          |               |          | 0.182  |          |               |          | 0.173                                     |          |               |          |                     |          |                             |          |  |          |
| Nitrate   | µg/L   | 10000             | < 200  | U        |               |          |  |          |               |          | < 0.1                                     | U        |               |          |                     |          |                             |          |  |          |
| Sulfate   | mg/L   | NV                | 9260   |          |               |          |  |          |               |          | 6.35                                      |          |               |          |                     |          |                             |          |  |          |
| Total organic carbon  | mg/L   | NV                | 58   |          |               |          |  |          |               |          | 9.46                                      |          |               |          |                     |          |                             |          |  |          |
| METALS  |        |                   |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Arsenic   | µg/L   | 10                |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Chromium  | µg/L   | 100               |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |
| Thallium  | µg/L   | 2                 |  |          |               |          |  |          |               |          |   |          |               |          |                     |          |                             |          |  |          |

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LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW48   |          |               |          | 16WW49   |          | 16WW51  |          |               |          | 16WW55  |          |               |          | 16WW56                                       |          |
|---|--------|-------------------|--|----------|---------------|----------|--|----------|---|----------|---------------|----------|---|----------|---------------|----------|--|----------|
|   |        |                   | 16WW48-181018                                  |          | 16WW48-190918 |          | 16WW49-190919  |          | 16WW51-190918                                       |          | 16WW51-190919 |          | 16WW55-181015                                   |          | 16WW55-190917 |          | 16WW56-190917                                |          |
|   |        |                   | 10/18/2018                                     |          | 9/18/2019     |          | 9/19/2019  |          | 9/18/2019   |          | 9/18/2019     |          | 10/15/2018                                      |          | 9/17/2019     |          | 9/17/2019                                    |          |
|   |        |                   | Shallow; Downgradient of Mid-Plume<br>ISB Area |          |               |          | Intermediate; Downgradient of<br>Mid-Plume<br>ISB Area |          | Intermediate; Downgradient of Mid-Plume<br>ISB Area |          |               |          | Shallow; Downgradient of Landfill Biobarrier #3 |          |               |          | Shallow; Downgradient<br>to Bayou Biobarrier |          |
| Parameter   | Units  | MCL/PCL           | Result   | Val Qual | Result        | Val Qual | Result   | Val Qual | Result  | Val Qual | Result        | Val Qual | Result  | Val Qual | Result        | Val Qual | Result                                       | Val Qual |
| VOCs  |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | 11   |          | 7             |          | < 0.5  | U        |   |          | < 0.5         | U        | < 5   | U        | 9.1           | J        | < 0.5  | U        |
| 1,2-Dichloroethane  | µg/L   | 5                 | 12   |          | 7             |          | 0.86   | J        |   |          | < 0.5         | U        | < 5   | U        | 5.3           | J        | < 0.5  | U        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | 2600   |          | 1800          |          | 130  |          |   |          | 9.1           |          | 540   |          | 310           |          | 1.7  |          |
| Methylene chloride  | µg/L   | 5                 | < 1  |          | < 5           | U        | < 1  | U        |   |          | < 1           | U        | < 10  | U        | < 10          | U        | < 1  | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 0.5  |          | < 2.5         | U        | < 0.5  | U        |   |          | < 0.5         | U        | < 5   | U        | < 5           | U        | < 0.5  | U        |
| Trichloroethene   | µg/L   | 5                 | 8800   |          | 3700          |          | 260  |          |   |          | 90            |          | 5900  |          | 3200          |          | 27   |          |
| Vinyl chloride  | µg/L   | 2                 | 15   |          | 7.4           |          | < 0.5  | U        |   |          | < 0.5         | U        | < 5   | U        | 37            |          | 0.41   | J        |
| PERCHLORATE   |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | 14   |          | < 2           | U        | < 2  | U        |   |          | < 2           | U        | 400   |          | 480           |          | < 2  | U        |
| DHC   |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Dehalococcoides   | CEQ/ML | NV                | 0.3  | J        |               |          |  |          |   |          |               |          | 0.5   | U        |               |          |  |          |
| DISSOLVED GASES   |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Ethane  | µg/L   | NV                | 0.174  | J        |               |          |  |          |   |          |               |          | 0.749   | J        |               |          |  |          |
| Ethylene  | µg/L   | NV                | 2.19   |          |               |          |  |          |   |          |               |          | 3.79  |          |               |          |  |          |
| Methane   | µg/L   | NV                | 2.21   |          |               |          |  |          |   |          |               |          | 136   |          |               |          |  |          |
| GENERAL CHEMISTRY   |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Alkalinity  | mg/L   | NV                | 259  |          |               |          |  |          |   |          |               |          | 347   |          |               |          |  |          |
| Bromide   | mg/L   | NV                | 4.33   |          |               |          |  |          |   |          |               |          | 2.12  |          |               |          |  |          |
| Nitrate   | µg/L   | 10000             | < 200  |          |               |          |  |          |   |          |               |          | < 100   | U        |               |          |  |          |
| Sulfate   | mg/L   | NV                | 1770   |          |               |          |  |          |   |          |               |          | 1110  |          |               |          |  |          |
| Total organic carbon  | mg/L   | NV                | 8.78   |          |               |          |  |          |   |          |               |          | 7.32  |          |               |          |  |          |
| METALS  |        |                   |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Arsenic   | µg/L   | 10                |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Chromium  | µg/L   | 100               |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |
| Thallium  | µg/L   | 2                 |  |          |               |          |  |          |   |          |               |          |   |          |               |          |  |          |

Notes:

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

b - 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL; thus, the background value will be considered the Cleanup Level for Manganese per Table 1-1 of the Draft Final RAWP (APTIM 2018)

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

mg/L - milligrams per liter

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

DHC - Dehalococcoides

LHAAP-16 Baseline Sampling  
October 2018 and September 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |        |                   | 16WW57  |          | 16WW58  |          |                  |          |
|---|--------|-------------------|---|----------|---|----------|------------------|----------|
|   |        |                   | 16WW57-190918   |          | 16WW58-190918   |          | 16WW58-190918-FD |          |
|   |        |                   | 9/18/2019   |          | 9/18/2019   |          | 9/18/2019        |          |
|   |        |                   | Intermediate; Across Harrison Bayou from Bayou Biobarrier |          | Intermediate; Across Harrison Bayou from Bayou Biobarrier |          |                  |          |
| Parameter   | Units  | MCL/PCL           | Result  | Val Qual | Result  | Val Qual | Result           | Val Qual |
| VOCs  |        |                   |   |          |   |          |                  |          |
| 1,1-Dichloroethene  | µg/L   | 7                 | 0.56  | J        | 3.9   | J        | 3.9              | J        |
| 1,2-Dichloroethane  | µg/L   | 5                 | < 0.5   | U        | < 2.5   | U        | < 2.5            | U        |
| cis-1,2-Dichloroethene  | µg/L   | 70                | < 0.5   | U        | 170   |          | 180              |          |
| Methylene chloride  | µg/L   | 5                 | < 1   | U        | < 5   | U        | < 5              | U        |
| 1,1,2-Trichloroethane   | µg/L   | 5                 | < 0.5   | U        | < 2.5   | U        | < 2.5            | U        |
| Trichloroethene   | µg/L   | 5                 | 24  |          | 4300  |          | 4100             |          |
| Vinyl chloride  | µg/L   | 2                 | < 0.5   | U        | < 2.5   | U        | < 2.5            | U        |
| PERCHLORATE   |        |                   |   |          |   |          |                  |          |
| Perchlorate   | µg/L   | 17 <sup>a</sup>   | < 2   | U        | < 2   | U        | < 2              | U        |
| DHC   |        |                   |   |          |   |          |                  |          |
| Dehalococcoides   | CEQ/ML | NV                | 35.3  |          | 17.8  |          |                  |          |
| DISSOLVED GASES   |        |                   |   |          |   |          |                  |          |
| Ethane  | µg/L   | NV                | 0.246   | J        | 0.332   | J        | 0.318            | J        |
| Ethylene  | µg/L   | NV                | 1.18  |          | 1.51  |          | 1.43             |          |
| Methane   | µg/L   | NV                | 2.44  |          | 3.62  |          | 4.37             |          |
| GENERAL CHEMISTRY   |        |                   |   |          |   |          |                  |          |
| Alkalinity  | mg/L   | NV                | 133   |          | 94  |          | 107              |          |
| Bromide   | mg/L   | NV                | 3.16  |          | 3.52  |          | 3.48             |          |
| Nitrate   | µg/L   | 10000             | < 0.1   | U        | < 100   | U        | < 100            | U        |
| Sulfate   | mg/L   | NV                | 2310  |          | 394   |          | 396              |          |
| Total organic carbon  | mg/L   | NV                | 10.9  |          | 4.21  |          | 4.27             |          |
| METALS  |        |                   |   |          |   |          |                  |          |
| Arsenic   | µg/L   | 10                |   |          |   |          |                  |          |
| Chromium  | µg/L   | 100               |   |          |   |          |                  |          |
| Manganese   | µg/L   | 7820 <sup>b</sup> |   |          |   |          |                  |          |
| Nickel  | µg/L   | 490 <sup>a</sup>  |   |          |   |          |                  |          |
| Thallium  | µg/L   | 2                 |   |          |   |          |                  |          |

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**Subject:** Final Minutes, Monthly Managers' Meeting (MMM),  
Longhorn Army Ammunition Plant (LHAAP)  
**Location of Meeting:** Teleconference  
**Date of Meeting:** 18 December 2019– 1:00 Central Standard Time (CST)

#### **Attendees:**

Army BRAC: Rose M. Zeiler (RMZ)  
USEPA: Rich Mayer (RM) and Kent Becher (KB)-USGS Liaison  
AEC: Amanda Sherman (AS)  
TCEQ: April Palmie (AP)  
USACE: Aaron Williams (AW)  
Bhate: Kim Nemmers (KN)  
APTIM: Bill Foss (BF), Rob Mayer and Praveen Srivastav (PS)  
USFWS: Paul Bruckwicki (PB)

#### **Action Items**

**Bhate/APTIM:** AS stated that the Public Affairs Office (PAO) has determined some standard language and process for adding a place on the LHAAP website for obtaining email addresses. However, the PAO has decided to not implement this at this time because no more munitions will be blown-in-place until a new contractor is selected for LHAAP-17. The action item is therefore no longer needed, until the new contract for LHAAP-17 is procured.

#### **Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update**

**Groundwater Treatment Plant (GWTP) -** KN started the discussion of the GWTP by explaining that the effluent was discharging to the Harrison Bayou. KN stated that the air stripper blower was installed incorrectly due to an error by the manufacturer of the sticker placement. KN explained that the blower installation had been corrected. Effluent was analyzed for volatile organic compounds (VOCs) as a rush turn around and the results were received December 17, 2019. KN explained the analytical results have trichloroethene (TCE) above the maximum contaminant level (MCL) of 5 parts per billion (ppb). KN stated that another effluent sample was collected for rush turn-around of the VOCs the day before the MMM and that the results should be available by the end of the week or Monday at the latest. Since the effluent could discharge to the bayou, the GWTP continues to operate. KN stated that the air stripper is pushing 4,000 cubic feet per minute of air through the system, which is more than it previously was able to do. However, if the results continue to have VOCs above the MCL, then Bhate will send someone out to assess the system.

**LHAAP-03 –** PS stated that water is still present in the excavation and a side wall at area C still needed to be excavated.

**LHAAP-16-** PS stated that the field team is still extracting and recirculating water from five wells, which started on December 5, 2019. As of Monday (Thursday results), bromide and total organic carbon (TOC) results were still low. PS explained that APTIM had sent this week's samples to APTIM's laboratory in Lawrenceville, NJ to expedite the sample results. PS stated that he had just received the Monday and Tuesday preliminary results, which showed that the bromide is still low but the TOC is up in all of the wells. RM asked if the bromide is moving more slowly than the TOC. PS said that they are not sure but it seems that bromide is being masked by high levels of sulfate in the groundwater. BF said that a study he had found indicates that bromide could be a poor tracer if the pH is lower than 7 and that the pH of the groundwater at LHAAP-16 is less than 7 so bromide could have attached to some of the clays. RM asked if there was a recommended alternative. BF said that

he could send a link to the site to the group but had not looked into alternatives. RM asked KB if he had used other tracers at similar sites. KB said that chlorides, nitrates and similar have been used as tracers at his sites. BF clarified that this doesn't mean that this is the case but this is just one possible explanation. PS said that over 16,700 gallons of water had been extracted as of 12/18/19 and that approximately 14,000 gallons has been reinjected. PS said that based upon the results and the amount extracted and injected, APTIM recommends ceasing recirculation. PS said that the additional water added has probably pushed the injectate out. PS reminded everyone that no pumping test was done as part of the remedial design, which has resulted in uncertainty regarding the implementation. Rob Mayer pointed out that the TOC increase was indicative of the substrate moving where it was desired. RMZ stated that the Army concurs with APTIM. RM asked if the confidence is due to the TOC. RMZ said that the TOC is a substantial increase and that the bromide could be masked as BF explained. AP asked about the data showing the TOC increase. PS stated that the data had not yet been provided. PS stated that the TOC is being detected at 40 to 80 mg/L, which is significantly higher than baseline concentrations. PS said that once the results are confirmed by the laboratory that it will be provided to the Regulators. PS stated that injections will start this Thursday or Friday and be complete this by Saturday or Sunday in time for the field crew to go home for the holidays. Regulators concurred that the approach seemed reasonable.

**LHAAP-17** – PS stated that the site has been secured with chains and signs indicating “No Trespassing.” PS stated that options for management of the water within the excavation that were discussed in the previous MMM were evaluated and each of the options have their own pros/cons. PS stated that BF evaluated acceptable levels for discharging of the water. BF took the 1,4-dioxane memorandum information provided by the Army and used it as the basis for calculating a discharge limit for explosives. BF said that the basis for the calculations is TCEQ guidance document RG-194 for Surface Water Quality Standards. BF stated that there were slight differences between the default values for certain variables provided in the guidance document and those used in the 1,4-dioxane memorandum. BF said he used the most conservative numbers where there were differences and the lowest discharge criteria for any of the three explosives compounds that he calculated was 2 parts per million (ppm), using a human health scenario where both water and fish tissue were consumed. The highest detection in the water at LHAAP-17 was less than 1 ppm. BF explained that the calculation is based upon dilution of the discharge using rates from the GWTP that were calculated in the 1,4-dioxane memorandum.

BF said that the current levels are acceptable for discharge at a rate similar to that of the GWTP. RM asked if the calculation sheet could be shared. RMZ pointed out that there will be a new project manager for USEPA after Christmas. AP clarified that discharge criteria comes from the TCEQ. AP asked about water flowing out of the excavations and that her prior input was not to allow overflow and discharge to surface water. BF stated that recent visits to LHAAP-17 had confirmed that the excavation nearest to the drainage ditches at LHAAP-17 (Area H) was not full and had freeboard space to accept more runoff without overflowing. BF clarified his earlier statements by explaining he was not saying the dilution value used in the calculation was based upon water flowing in but more about the dilution with the bayou if we were to pump out the excavation.

AP said that she understood the currently considered options for water management to be a) direct discharge, b) treatment via the GWTP and then c) land application. BF asked if land application was even an option. AP said that land application is allowed and has its own calculations. BF asked if it would be similar to that of wastewater irrigation application. AP said that the water has to be intended for beneficial reuse and that she thinks the calculations are the same as wastewater irrigation application. AP said that discharging to the bayou (a or b) is probably better than land application. KN pointed out that the perchlorate detected was not necessarily an issue if going to the bayou given

the detections from the prior samples, with the exception of one sample. BF stated that the explosives are known to degrade in sunlight and could be less than previously detected in the water sampled. AP asked if the discharge criteria was something being considered for the beginning of the year. BF confirmed that it was. AP said that the calculations go to her with a copy to USEPA, and then AP verifies that the submittal is substantially complete. AP then submits to surface water quality group. RM said that the USEPA will also review. BF stated that some of the information for the 1,4-dioxane calculations are different than what is online. AP said that some of the values were changed in the 1,4-dioxane calculations based on updated guidance, and she would send over some information from the development of the perchlorate discharge criteria. RM asked when the information will be submitted. BF said that the information will be sent early in 2020. AP said that she will forward emails for the process that resulted in the perchlorate effluent calculations.

PS stated that the other issue is that the soil is not firm enough to bring in equipment and trucks to allow for backfilling.

**SmartMap** - RM stated that data for LHAAP-18/24 is not currently present in the SmartMap. KN concurred and said that the team was working to get the data entered. KN said that she would have an update after the holidays. RM said that the system was slow. BF said that this is due to the way the SmartMap was originally programmed to load a large amount of data before initially displaying the map, but that it speeds up once you are in the system. RM asked if a note could be added to explain that the system is slow when you first enter.

KN asked everyone to refer to the Document and Issues Tracking Table dated December 18, 2019.

- **Task 1** (Project Management) – KN stated the Restoration Advisory Board (RAB) meeting was planned for January 16, 2020. AP asked what time the Monthly Manager's Meeting (MMM) was in January. RMZ asked that we meet at 10:30 am. AS asked if there would be any site visits. RMZ pointed out that RM's replacement would need to visit some sites. KN stated that the November MMM minutes had been issued to the Regulators on December 9<sup>th</sup>, 2019.
- **Task 3** (LHAAP-03) – PS stated that no documents were in progress.
- **Task 4** (LHAAP-04) – PS stated that the Remedial Action Completion report (RACR) has been started. PS stated that the performance data from November 2019 is included in the data package for the meeting. RM asked about perchlorate detections. BF stated that several of the monitoring wells that had high detections of perchlorate had substrate in the wells and couldn't be sampled. RM asked if the well next to the fire station would be sampled. BF said that it was sampled during the baseline sampling and no perchlorate was detected.
- **Task 5** (LHAAP-12) – PS stated that the annual groundwater sampling had been completed the week of December 3, 2019 and that the sampling included the new well installed in August 2019.
- **Task 6** (LHAAP-16) – PS stated that the performance monitoring data is included with this month's validated data. PS explained that high bromide and TOC were detected in three wells that are located in Biobarriers 1 and 3.
- **Task 7** (LHAAP-17) – PS stated that the site had already been discussed. AP asked about putting berms or hay bales around the area. BF stated that Area H was half full at this point and had received water from upgradient. RM asked PB about his observations. PB stated that he observed surface water flowing from the north east by the road to a larger excavation area but he did not observe any water going out of the excavations.



- **Task 9** (LHAAP-37) – PS stated that the Year 3 1<sup>st</sup> semiannual sampling was done in November and will be shared in the January 2020 meeting. PS stated that the Year 2 Annual RA(O) Report is being prepared.
- **Task 10** (LHAAP-46) –PS stated that Year 5 Annual RA-O data report is in progress.
- **Task 11** (LHAAP-50) –PS stated that the Year 5 RA-O Report is being prepared. PS stated that the annual RA-O sampling was completed in November 2019 and the validated data was provided with the December 2019 MMM. Responses to Regulatory comments on Draft Remedial Action Work Plan (RAWP) are being prepared for Army review. BF said that one note regarding EPA's comment on the groundwater flow velocity is that the flow rate reported is based upon current instantaneous picture and that a different gradient and flow direction could have existed in the past.
- **Task 12** (LHAAP-58) – KN stated that the Year 5 RA (O) Report was issued draft final and Regulators concurred. KN stated that LHAAP-58 was being sampled currently and that the sampling results will likely be presented at the February 2020 MMM.
- **Task 13** (LHAAP-67) – PS stated that the draft Year 5 RA-O Report is under Army review and comment for issuance to the Regulators in January 2020. PS indicated that the site was sampled the last week of October, and that data was provided for December 2019 MMM. BF pointed out that the results for the two new wells, which are clean, was provided.
- **Task 14** (LHAAP-001-R and -003-R) - KN stated that there are no documents currently in progress.
- **Task 16** (GWTP) – KN indicated that the 3<sup>rd</sup> Quarter 2019 GWTP Report was issued to the Regulators today and that she would follow up with an email notification.
- **Task 17** (LHAAP-18/24) – KN stated that LHAAP-18/24 sampling had been completed in December 2019 and that the validated data will be provided at the February 2020 MMM.
- **Task 18** (Surface Water) – KN stated that the most recent surface water results are from October 2019 and that no issues were noted.
- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was completed and would be placed into the AR
- **Administrative Record** – PS stated that the next AR update is being prepared with a cutoff of June 30, 2019.

#### **Update on other DERP Sites:**

- **LHAAP 18/24** –RMZ stated that the DF ROD redlined text and Response to Comments will be issued later in the day. RMZ asked if Rich could provide an email stating whether EPA approved. RM stated that USEPA is ready to sign the ROD if the responses are acceptable. AP asked that the tables be sent out revised to show the corrections since you cannot redline in excel.
- **LHAAP-29** – AW stated that the PP and ROD are being included in the AR. AP asked AW if the next phase of work at LHAAP-29 is waiting on the completion of the LHAAP-18/24 ROD to which AW responded that it was.
- **LHAAP-47** – AW stated that the 2<sup>nd</sup> Addendum to the PSI Report was expected by the next day and that it is only five pages. AW stated that he hoped it would be out to the Regulators early the next week. RMZ asked that the Regulators let them know if there are any format issues or anything of concern. AW explained that a units issue was identified and corrected for soil. RMZ stated that correction of the error results in no exceedances in the northern portion of the site in soil. RM confirmed that groundwater is still the issue. RMZ stated that she would set up a separate call for the next morning and include a map for the discussion.

### **Schedule Next Managers' Meeting**

The next MMM will be held on Thursday, January 16, 2020 at 10:30 am CST at the LHAAP trailer.

Meeting concluded at approximately 2:30 pm CST.

### **ACRONYM LIST**

|       |   |
|-------|---|
| AEC   | Army Environmental Command                    |
| AP    | April Palmie                                  |
| APTIM | APTIM Federal Services, LLC                   |
| AR    | Administrative Record                         |
| AS    | Amanda Sherman                                |
| AW    | Aaron Williams                                |
| BF    | Bill Foss                                     |
| Bhate | Bhate Environmental Associates, Inc.          |
| BRAC  | Base Realignment and Closure                  |
| CST   | Central Standard Time                         |
| DERP  | Defense Environmental Restoration Program     |
| GWTP  | Groundwater Treatment Plant                   |
| KB    | Kent Becher                                   |
| KN    | Kim Nemmers                                   |
| LHAAP | Longhorn Army Ammunition Plant                |
| MCL   | Maximum contaminant level                     |
| MMM   | Monthly Managers' Meeting                     |
| MNA   | Monitored natural attenuation                 |
| PAO   | Public Affairs Office                         |
| PBR   | Performance-Based Remediation                 |
| PP    | Proposed Plan                                 |
| PPM   | Parts per million                             |
| PS    | Praveen Srivastav                             |
| PSI   | Post-Screening Investigation                  |
| RAB   | Restoration Advisory Board                    |
| RACR  | Remedial Action Completion Report             |
| RA(O) | Remedial Action – Operation                   |
| RAWP  | Remedial Action Work Plan                     |
| RD    | Remedial Design                               |
| RM    | Rich Mayer                                    |
| RMZ   | Rose M. Zeiler                                |
| ROD   | Record of Decision                            |
| TCE   | Trichloroethene                               |
| TCEQ  | Texas Commission on Environmental Quality     |
| TOC   | Total organic carbon                          |
| USACE | United States Army Corps of Engineers         |
| USEPA | United States Environmental Protection Agency |
| VOC   | Volatile organic compound                     |

**LHAAP Validated Data Packages for  
December 2019 Monthly Manager's Meeting**

| <b>LHAAP Area</b>    | <b>Analytic Method</b>   |
|----------------------|--|
| <b>LHAAP-04</b>      | <b><i>November 2019 Baseline During Injection Sampling</i></b><br><i>Perchlorate (EPA 6850)</i>  |
| <b>LHAAP-16</b>      | <b><i>Map of Performance Sampling Locations</i></b><br><b><i>October 2018 and September 2019 Baseline Sampling</i></b><br><i>TOC (SM5310C)</i><br><i>Bromide (SW9056A)</i>   |
| <b>LHAAP-50</b>      | <b><i>Year 6 Annual RA(O) Sampling - November 2019</i></b><br><i>Perchlorate (EPA 6850)</i><br><i>Volatile Organic Compounds (SW8260)</i><br><i>Dissolved Gases (RSK-175)</i><br><i>Anions (SW9056)</i><br><i>Total Organic Carbon (SM5310)</i>  |
| <b>LHAAP-67</b>      | <b><i>Year 6 Annual RA(O) Sampling - October 2019</i></b><br><i>Volatile Organic Compounds (SW8260)</i><br><i>Dissolved Gases (RSK-175)</i><br><i>Anions (SW9056)</i><br><i>Total Organic Carbon (SM5310)</i>  |
| <b>GWTP Effluent</b> | <b><i>Weekly Perchlorate Sampling – November 2019</i></b><br><i>Perchlorate (6850)</i>   |
| <b>GWTP Effluent</b> | <b><i>Weekly, Bi-Weekly, and Monthly Sampling – November 2019</i></b><br><i>Ammonia (350.3)</i><br><i>Ortho-Phosphate (365.3)</i><br><i>Total Organic Carbon (SM5310)</i><br><i>VOC (8260C)</i><br><i>Metals (6020A)</i><br><i>Hexavalent Chromium (7196A)</i><br><i>1,4-Dioxane (8270D-SIM)</i><br><i>Anions (9056)</i> |
| <b>GWTP Influent</b> | <b><i>Monthly Sampling – November 2019</i></b><br><i>Metals (6020A)</i><br><i>Perchlorate (6850)</i><br><i>Hexavalent Chromium (7196A)</i>   |

**LHAAP-04 Baseline During  
Injection Sampling November  
2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |     | 04WW02                               |          |                                      |          | 04WW03                                   |          | 04WW04                             |          |
|--|-------|-----|--------------------------------------|----------|--------------------------------------|----------|--|----------|------------------------------------|----------|
|  |       |     | 04WW02-191105                        |          | 04WW02-191105-FD                     |          | 04WW03-191106                            |          | 04WW04-191106                      |          |
|  |       |     | 11/5/2019                            |          | 11/5/2019                            |          | 11/6/2019                                |          | 11/6/2019                          |          |
|  |       |     | Shallow Zone,<br>Upgradient of Plume |          | Shallow Zone,<br>Upgradient of Plume |          | Shallow Zone, Far<br>Upgradient of Plume |          | Shallow Zone, Within<br>Plume Area |          |
| Parameter  | Units | PCL | Result                               | Val Qual | Result                               | Val Qual | Result                                   | Val Qual | Result                             | Val Qual |
| Perchlorate  | µg/L  | 17  | < 2                                  | U        | < 2                                  | U        | < 2                                      | U        | < 2                                | U        |

Notes:

Baseline sampling took place after injections had already started. Wells 04WW01, 04WW07, 04WW09, and 04WW10 were not sampled due to the presence of visible emulsified vegetable oil in the wells from the injections.

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Val Qual - validation qualifier

**LHAAP-04 Baseline During  
Injection Sampling November  
2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |     | 04WW05                          |          | 04WW06                                     |          | 04WW08   |          | 04WW11                              |          |
|--|-------|-----|---------------------------------|----------|--|----------|--|----------|-------------------------------------|----------|
|  |       |     | 04WW05-191106                   |          | 04WW06-191106                              |          | 04WW08-191106  |          | 04WW11-191106                       |          |
|  |       |     | 11/6/2019                       |          | 11/6/2019                                  |          | 11/6/2019  |          | 11/6/2019                           |          |
|  |       |     | Shallow Zone, Within Plume Area |          | Shallow Zone, Cross-Gradient to Plume Area |          | Intermediate Zone, Slightly Upgradient of Plume Area |          | Shallow Zone, Downgradient of Plume |          |
| Parameter  | Units | PCL | Result                          | Val Qual | Result                                     | Val Qual | Result   | Val Qual | Result                              | Val Qual |
| Perchlorate  | µg/L  | 17  | < 2                             | U        | < 2  | U        | 13   |          | < 2                                 | U        |

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**LHAAP-04 Baseline During  
Injection Sampling November  
2019**

|  |              |            |   |                 |  |                 |   |                 |
|--|--------------|------------|---|-----------------|--|-----------------|---|-----------------|
| <b>Location Code</b><br><b>Sample ID</b><br><b>Sample Date</b><br><b>Location Description:</b> |              |            | <b>Fire Station Well</b>                              |                 | <b>LHSMW01</b>   |                 | <b>LHSMW02</b>  |                 |
|  |              |            | <b>FIRE STATION WELL-</b>                             |                 | <b>LHSMW01-191106</b>                                  |                 | <b>LHSMW02-191105</b>                                   |                 |
|  |              |            | <b>11/6/2019</b>                                      |                 | <b>11/6/2019</b>                                       |                 | <b>11/5/2019</b>  |                 |
|  |              |            | <b>Deep Zone,<br/>Cross/downgradient of<br/>Plume</b> |                 | <b>Shallow Zone, Cross-<br/>Gradient to Plume Area</b> |                 | <b>Shallow Zone,<br/>Downgradient to Plume<br/>Area</b> |                 |
| <b>Parameter</b>   | <b>Units</b> | <b>PCL</b> | <b>Result</b>   | <b>Val Qual</b> | <b>Result</b>  | <b>Val Qual</b> | <b>Result</b>   | <b>Val Qual</b> |
| Perchlorate  | µg/L         | 17         | < 2   | U               | < 2  | U               | < 2   | U               |

Notes:

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PCL - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level for groundwater

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

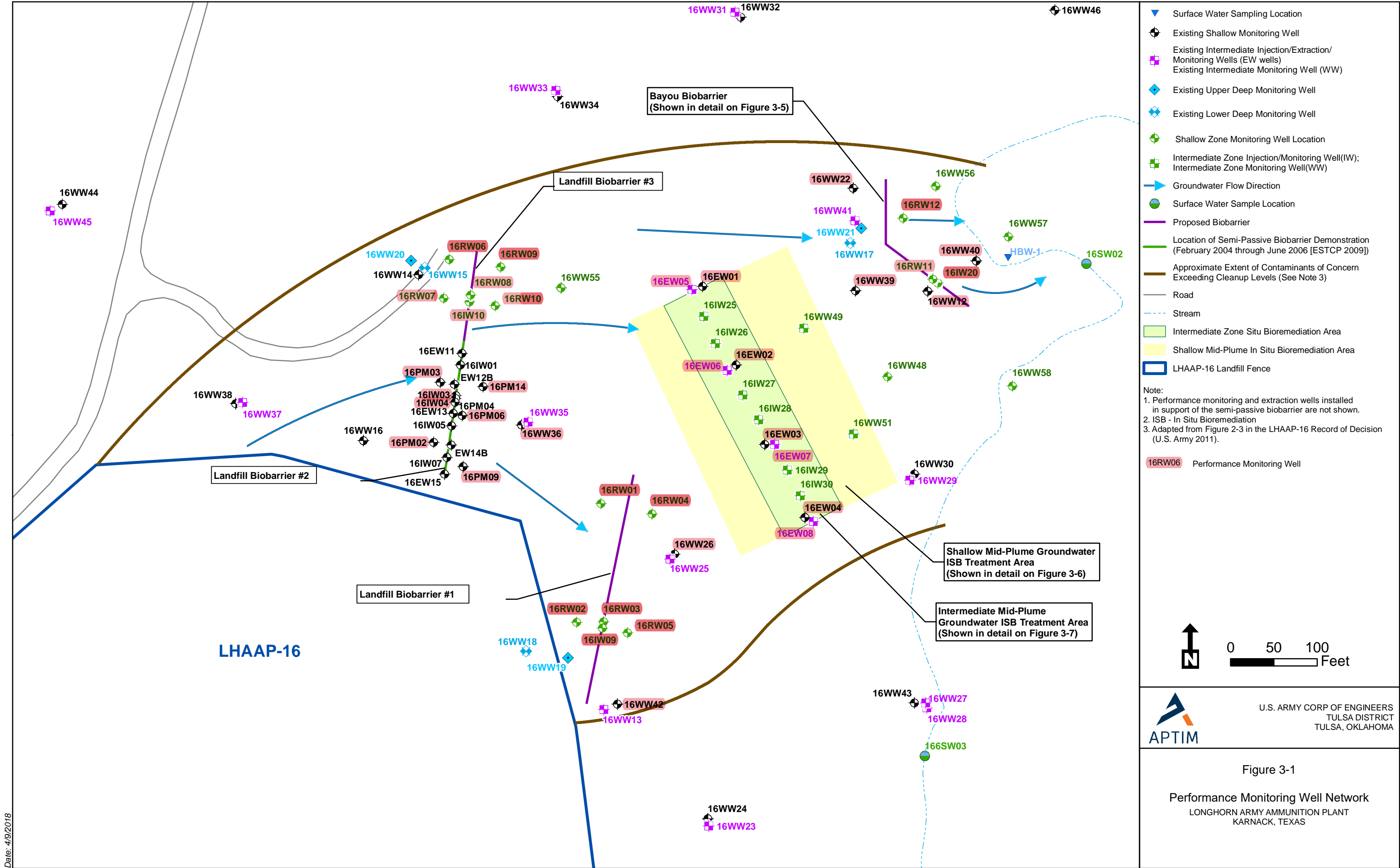
U - Undetected. The analyte was analyzed for, but not detected.

µg/L - micrograms per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier



**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code         |       | 16EW01                             |          | 16EW02                             |          | 16EW03                             |          |
|-----------------------|-------|------------------------------------|----------|------------------------------------|----------|------------------------------------|----------|
| Sample ID             |       | 16EW01-191111                      |          | 16EW02-191111                      |          | 16EW03-191111                      |          |
| Sample Date           |       | 11/11/2019                         |          | 11/11/2019                         |          | 11/11/2019                         |          |
| Location Description: |       | Shallow; Inside Mid-Plume ISB Area |          | Shallow; Inside Mid-Plume ISB Area |          | Shallow; Inside Mid-Plume ISB Area |          |
| Parameter             | Units | Result                             | Val Qual | Result                             | Val Qual | Result                             | Val Qual |
| GENERAL CHEMISTRY     |       |                                    |          |                                    |          |                                    |          |
| Bromide               | mg/L  | 3.33                               |          | 1.74                               |          | 5.3                                |          |
| Total organic carbon  | mg/L  | 9.06                               |          | 10.3                               |          | 22.6                               |          |

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation



**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       | 16EW04                             |          |                  |          | 16EW05                                  |          |               |          |               |          |               |          |
|--|-------|------------------------------------|----------|------------------|----------|---|----------|---------------|----------|---------------|----------|---------------|----------|
|  |       | 16EW04-191111                      |          | 16EW04-191111-FD |          | 16EW05-191018                           |          | 16EW05-191025 |          | 16EW05-191105 |          | 16EW05-191111 |          |
|  |       | 11/11/2019                         |          | 11/11/2019       |          | 10/18/2019                              |          | 10/25/2019    |          | 11/5/2019     |          | 11/11/2019    |          |
|  |       | Shallow; Inside Mid-Plume ISB Area |          |                  |          | Intermediate; Inside Mid-plume ISB Area |          |               |          |               |          |               |          |
| Parameter  | Units | Result                             | Val Qual | Result           | Val Qual | Result                                  | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| GENERAL CHEMISTRY  |       |                                    |          |                  |          |   |          |               |          |               |          |               |          |
| Bromide  | mg/L  | 2.48                               |          | 2.54             |          | 3.92                                    |          | 1.93          |          | 2.82          |          | 2.78          |          |
| Total organic carbon   | ma/L  | 13.6                               |          | 15.3             |          |   |          |               |          |               |          |               |          |

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       | 16EW06                                  |          |                      |          |               |          | 16EW07                                  |          |               |          |               |          |
|--|-------|---|----------|----------------------|----------|---------------|----------|---|----------|---------------|----------|---------------|----------|
|  |       | 16EW06-191022                           |          | 16EW06-EVENT2-191031 |          | 16EW06-191108 |          | 16EW07-191018                           |          | 16EW07-191025 |          | 16EW07-191105 |          |
|  |       | 10/22/2019                              |          | 10/31/2019           |          | 11/8/2019     |          | 10/18/2019                              |          | 10/25/2019    |          | 11/5/2019     |          |
|  |       | Intermediate; Inside Mid-plume ISB Area |          |                      |          |               |          | Intermediate; Inside Mid-plume ISB Area |          |               |          |               |          |
| Parameter  | Units | Result                                  | Val Qual | Result               | Val Qual | Result        | Val Qual | Result                                  | Val Qual | Result        | Val Qual | Result        | Val Qual |
| GENERAL CHEMISTRY  |       |   |          |                      |          |               |          |   |          |               |          |               |          |
| Bromide  | mg/L  | 2.99                                    |          | 2.06                 |          | 4.6           |          | 1.37                                    |          | 2.79          |          | 2.96          |          |
| Total organic carbon   | mg/L  |   |          |                      |          |               |          |   |          |               |          |               |          |

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

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**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       | 16EW08                                  |          |               |          | 16IW09                               |          | 16IW10                               |          | 16IW20                         |          | 16RW01  |          | 16RW02  |          |
|--|-------|---|----------|---------------|----------|--------------------------------------|----------|--------------------------------------|----------|--------------------------------|----------|---|----------|---|----------|
|  |       | 16EW08-191022                           |          | 16EW08-191106 |          | 16IW09-191119                        |          | 16IW10-191120                        |          | 16IW20-191022                  |          | 16RW01-191119                                 |          | 16RW02-191119                                 |          |
|  |       | 10/22/2019                              |          | 11/6/2019     |          | 11/19/2019                           |          | 11/20/2019                           |          | 10/22/2019                     |          | 11/19/2019                                    |          | 11/19/2019                                    |          |
|  |       | Intermediate; Inside Mid-plume ISB Area |          |               |          | Shallow; Landfill Biobarrier #1 Area |          | Shallow; Landfill Biobarrier #3 Area |          | Shallow; Bayou Biobarrier Area |          | Shallow; Upgradient of Landfill Biobarrier #1 |          | Shallow; Upgradient of Landfill Biobarrier #1 |          |
| Parameter  | Units | Result                                  | Val Qual | Result        | Val Qual | Result                               | Val Qual | Result                               | Val Qual | Result                         | Val Qual | Result  | Val Qual | Result  | Val Qual |
| GENERAL CHEMISTRY  |       |   |          |               |          |                                      |          |                                      |          |                                |          |   |          |   |          |
| Bromide  | mg/L  | 20.6                                    |          | 41.8          |          | 70.7                                 |          | 201                                  |          | 4.09                           |          | 0.52  |          | 0.13  |          |
| Total organic carbon   | mg/L  |   |          |               |          | 7820                                 |          | 1850                                 |          | 38                             |          | 3.66  |          | 4.37  | J        |

Notes:

J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       | 16RW03                                 |          | 16RW04  |          |                  |          | 16RW05  |          | 16RW06  |          |                  |          | 16RW07  |          |
|--|-------|--|----------|---|----------|------------------|----------|---|----------|---|----------|------------------|----------|---|----------|
|  |       | 16RW03-191119                          |          | 16RW04-191119                                   |          | 16RW04-191119-FD |          | 16RW05-191119                                   |          | 16RW06-191120                                 |          | 16RW06-191120-FD |          | 16RW07-191120                                 |          |
|  |       | 11/19/2019                             |          | 11/19/2019                                      |          | 11/19/2019       |          | 11/19/2019                                      |          | 11/20/2019                                    |          | 11/20/2019       |          | 11/20/2019                                    |          |
|  |       | Shallow; Within Landfill Biobarrier #1 |          | Shallow; Downgradient of Landfill Biobarrier #1 |          |                  |          | Shallow; Downgradient of Landfill Biobarrier #1 |          | Shallow; Upgradient of Landfill Biobarrier #3 |          |                  |          | Shallow; Upgradient of Landfill Biobarrier #3 |          |
| Parameter  | Units | Result                                 | Val Qual | Result  | Val Qual | Result           | Val Qual | Result  | Val Qual | Result  | Val Qual | Result           | Val Qual | Result  | Val Qual |
| GENERAL CHEMISTRY  |       |  |          |   |          |                  |          |   |          |   |          |                  |          |   |          |
| Bromide  | mg/L  | 0.713                                  |          | 0.66  |          | 0.656            |          | 75.4  |          | 5.03  |          | 5.05             |          | 4.25  |          |
| Total organic carbon   | mg/L  | 2.51                                   | J        | 2.81  |          | 2.8              |          | 791   |          | 1.54  |          | 1.55             |          | 1.59  |          |

Notes:

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mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       | 16RW08                                 |          | 16RW09  |          | 16RW10  |          | 16RW11                           |          | 16RW12                                    |          |                  |          | 16WW12                                  |          |
|--|-------|--|----------|---|----------|---|----------|----------------------------------|----------|---|----------|------------------|----------|---|----------|
|  |       | 16RW08-191120                          |          | 16RW09-191120                                   |          | 16RW10-191120                                   |          | 16RW11-191022                    |          | 16RW12-191022                             |          | 16RW12-191022-FD |          | 16WW12-191022                           |          |
|  |       | 11/20/2019                             |          | 11/20/2019                                      |          | 11/20/2019                                      |          | 10/22/2019                       |          | 10/22/2019                                |          | 10/22/2019       |          | 10/22/2019                              |          |
|  |       | Shallow; Within Landfill Biobarrier #3 |          | Shallow; Downgradient of Landfill Biobarrier #3 |          | Shallow; Downgradient of Landfill Biobarrier #3 |          | Shallow; Within Bayou Biobarrier |          | Shallow; Downgradient of Bayou Biobarrier |          |                  |          | Shallow; Upgradient of Bayou Biobarrier |          |
| Parameter  | Units | Result                                 | Val Qual | Result  | Val Qual | Result  | Val Qual | Result                           | Val Qual | Result                                    | Val Qual | Result           | Val Qual | Result                                  | Val Qual |
| GENERAL CHEMISTRY  |       |  |          |   |          |   |          |                                  |          |   |          |                  |          |   |          |
| Bromide  | mg/L  | 6.06                                   |          | 4.53  |          | 3.99  |          | 213                              |          | 3.85                                      |          | 3.9              |          | 3.56                                    |          |
| Total organic carbon   | mg/L  | 2.02                                   |          | 1.99  |          | 4.08  |          | 3290                             |          | 1.78                                      |          | 1.91             |          | 7.51                                    |          |

Notes:

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mg/L - milligrams per liter

FD - field duplicate

ID - identification

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**LHAAP-16 Bayou Biobarrier, Landfill Biobarrier #1, Landfill Biobarrier #3, Shallow Mid-Plume Area and Intermediate Mid-Plume Area Performance Sampling  
October and November 2019**

| Location Code            |       | 16WW22                                  |          | 16WW26  |          | 16WW39                                  |          | 16WW40                                    |          | 16WW42  |          |
|--------------------------|-------|---|----------|---|----------|---|----------|---|----------|---|----------|
| Sample ID                |       | 16WW22-191022                           |          | 16WW26-191119                                   |          | 16WW39-191022                           |          | 16WW40-191022                             |          | 16WW42-191119                                   |          |
| Sample Date              |       | 10/22/2019                              |          | 11/19/2019                                      |          | 10/22/2019                              |          | 10/22/2019                                |          | 11/19/2019                                      |          |
| Location Description:    |       | Shallow; Upgradient of Bayou Biobarrier |          | Shallow; Downgradient of Landfill Biobarrier #1 |          | Shallow; Upgradient of Bayou Biobarrier |          | Shallow; Downgradient of Bayou Biobarrier |          | Shallow; Downgradient of Landfill Biobarrier #3 |          |
| Parameter                | Units | Result                                  | Val Qual | Result  | Val Qual | Result                                  | Val Qual | Result                                    | Val Qual | Result  | Val Qual |
| <b>GENERAL CHEMISTRY</b> |       |   |          |   |          |   |          |   |          |   |          |
| Bromide                  | mg/L  | 3.5                                     |          | 0.262   |          | 4.96                                    |          | 4.49                                      |          | 0.662   |          |
| Total organic carbon     | mg/L  | 1.84                                    |          | 2.38  |          | 3.53                                    |          | 7.72                                      |          | 3.94  |          |

Notes:

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mg/L - milligrams per liter

FD - field duplicate

ID - identification

Val Qual - validation qualifier

ISB - in-situ bioremediation

**LHAAP-50 Year 6 Annual RA(O) Sampling  
November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |                      | 50WW05  |          | 50WW06                                |          | 50WW08  |          | 50WW09  |          |                  |          |
|--|-------|----------------------|---|----------|---------------------------------------|----------|---|----------|---|----------|------------------|----------|
|  |       |                      | 50WW05-191108                                       |          | 50WW06-191112                         |          | 50WW08-191112                                     |          | 50WW09-191111                                     |          | 50WW09-191111-FD |          |
|  |       |                      | 11/8/2019   |          | 11/12/2019                            |          | 11/12/2019  |          | 11/11/2019  |          | 11/11/2019       |          |
|  |       |                      | Site 50 - NE, lower shallow, outside site boundary. |          | Site 50 - ENE, outside site boundary. |          | Site 50 - E, upper shallow, inside site boundary. |          | Site 50 - E, lower shallow, inside site boundary. |          |                  |          |
| Parameter  | Units | MCL/PCL <sup>a</sup> | Result  | Val Qual | Result                                | Val Qual | Result  | Val Qual | Result  | Val Qual | Result           | Val Qual |
| PERCHLORATE  |       |                      |   |          |                                       |          |   |          |   |          |                  |          |
| Perchlorate  | µg/L  | 17 <sup>a</sup>      | < 2   | U        | 4300                                  |          | 83  |          | 6.6   |          | 7.4              |          |
| VOLATILES  |       |                      |   |          |                                       |          |   |          |   |          |                  |          |
| 1,1-Dichloroethene   | µg/L  | 7                    | 4.8   |          | < 0.5                                 | U        | 1.2   |          | < 0.5   | U        | < 0.5            | U        |
| 1,2-Dichloroethane   | µg/L  | 5                    | 2.7   |          | < 0.5                                 | U        | 2.2   |          | < 0.5   | U        | < 0.5            | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70                   | 200   |          | 1.2                                   |          | 39  |          | 4.1   |          | 4                |          |
| Tetrachloroethene  | µg/L  | 5                    | 1.2   |          | < 0.5                                 | U        | 1.3   |          | < 0.5   | U        | < 0.5            | U        |
| Trichloroethene  | µg/L  | 5                    | 290   |          | 41                                    |          | 420   |          | 30  |          | 30               |          |
| Vinyl chloride   | µg/L  | 2                    | < 0.5   | U        | < 0.5                                 | U        | < 0.5   | U        | < 0.5   | U        | < 0.5            | U        |
| GASES  |       |                      |   |          |                                       |          |   |          |   |          |                  |          |
| Carbon dioxide   | µg/L  | NV                   |   |          | 120000                                |          | 69000   |          |   |          |                  |          |
| Ethane   | µg/L  | NV                   |   |          | < 0.47                                | U        | < 0.47  | U        |   |          |                  |          |
| Ethylene   | µg/L  | NV                   |   |          | < 0.55                                | U        | < 0.55  | U        |   |          |                  |          |
| Methane  | µg/L  | NV                   |   |          | 1.1                                   | J        | 3   |          |   |          |                  |          |
| GENERAL CHEMISTRY  |       |                      |   |          |                                       |          |   |          |   |          |                  |          |
| Chloride   | mg/L  | NV                   |   |          | 84.1                                  |          | 361   |          |   |          |                  |          |
| Nitrate  | mg/L  | 10                   |   |          | < 0.1                                 | U        | 0.118   |          |   |          |                  |          |
| Sulfate  | mg/L  | NV                   |   |          | 20.8                                  |          | 304   |          |   |          |                  |          |
| Total organic carbon   | mg/L  | NV                   |   |          | 1.63                                  |          | 0.83  |          |   |          |                  |          |

**Notes:**

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

**LHAAP-50 Year 6 Annual RA(O) Sampling  
November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |                      | 50WW10   |          | 50WW11   |          | 50WW12   |          |                  |          | 50WW13   |          | 50WW14  |          |
|--|-------|----------------------|--|----------|--|----------|--|----------|------------------|----------|--|----------|---|----------|
|  |       |                      | 50WW10-191111                                    |          | 50WW11-191112  |          | 50WW12-191112  |          | 50WW12-191112-FD |          | 50WW13-191113                                      |          | 50WW14-191113   |          |
|  |       |                      | 11/11/2019                                       |          | 11/12/2019   |          | 11/12/2019   |          | 11/12/2019       |          | 11/13/2019   |          | 11/13/2019  |          |
|  |       |                      | Site 50 - E, intermediate, inside site boundary. |          | Site 50 - ENE, upper shallow, outside site boundary. |          | Site 50 - ENE, upper shallow, outside site boundary. |          |                  |          | Site 50 - E, upper shallow, outside site boundary. |          | Site 50 - E, lower shallow, outside site boundary, along S. Crockett Ave. |          |
| Parameter  | Units | MCL/PCL <sup>a</sup> | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result           | Val Qual | Result   | Val Qual | Result  | Val Qual |
| PERCHLORATE  |       |                      |  |          |  |          |  |          |                  |          |  |          |   |          |
| Perchlorate  | µg/L  | 17 <sup>a</sup>      | < 2  | U        | 8000   |          | 47000  |          | 43000            |          | 4900   |          | < 2   | U        |
| VOLATILES  |       |                      |  |          |  |          |  |          |                  |          |  |          |   |          |
| 1,1-Dichloroethene   | µg/L  | 7                    | < 0.5  | U        | 26   |          | 4.6  |          | 4.1              |          | 17   | J        | < 0.5   | U        |
| 1,2-Dichloroethane   | µg/L  | 5                    | < 0.5  | U        | 28   |          | 2.7  |          | 2.7              |          | 39   |          | < 0.5   | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70                   | < 0.5  | U        | 58   |          | < 0.5  | U        | 0.76             | J        | 230  |          | 1.7   |          |
| Tetrachloroethene  | µg/L  | 5                    | < 0.5  | U        | < 5  | U        | < 0.5  | U        | < 0.5            | U        | < 12   | U        | < 0.5   | U        |
| Trichloroethene  | µg/L  | 5                    | < 0.5  | U        | 3300   |          | 280  |          | 260              |          | 7300   |          | 37  |          |
| Vinyl chloride   | µg/L  | 2                    | < 0.5  | U        | < 5  | U        | < 0.5  | U        | < 0.5            | U        | < 12   | U        | < 0.5   | U        |
| GASES  |       |                      |  |          |  |          |  |          |                  |          |  |          |   |          |
| Carbon dioxide   | µg/L  | NV                   |  |          | 270000   |          | 250000   |          | 300000           |          | 86000  |          | 97000   |          |
| Ethane   | µg/L  | NV                   |  |          | < 0.47   | U        | < 0.47   | U        | < 0.47           | U        | < 0.47   | U        | < 0.47  | U        |
| Ethylene   | µg/L  | NV                   |  |          | < 0.55   | U        | < 0.55   | U        | < 0.55           | U        | < 0.55   | U        | < 0.55  | U        |
| Methane  | µg/L  | NV                   |  |          | 6.8  |          | 1.5  |          | 1.6              |          | 4.7  |          | 1.8   |          |
| GEN CHEMISTRY  |       |                      |  |          |  |          |  |          |                  |          |  |          |   |          |
| Chloride   | mg/L  | NV                   |  |          | 294  |          | 1070   |          | 1060             |          | 308  |          | 395   |          |
| Nitrate  | mg/L  | 10                   |  |          | < 0.1  | U        | < 0.1  | U        | < 0.1            | U        | < 0.1  | U        | < 0.1   | U        |
| Sulfate  | mg/L  | NV                   |  |          | 351  |          | 531  |          | 533              |          | 316  |          | 357   |          |
| Total organic carbon   | mg/L  | NV                   |  |          | 1.49   |          | 1.11   |          | 1.19             |          | 1.78   |          | 0.88  |          |

**Notes:**

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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U - Undetected. The analyte was analyzed for, but not detected.

µg/L - micrograms per liter

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FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established



**LHAAP-50 Year 6 Annual RA(O) Sampling  
November 2019**

| Location Code          |       |                      | 50WW15   |          | 50WW16   |          | 50WW17   |          | 50WW18   |          | 50WW21   |          | 50WW22  |          |
|------------------------|-------|----------------------|--|----------|--|----------|--|----------|--|----------|--|----------|---|----------|
| Sample ID              |       |                      | 50WW15-191108  |          | 50WW16-191113  |          | 50WW17-191108  |          | 50WW18-191108  |          | 50WW21-191108  |          | 50WW22-191112                                       |          |
| Sample Date            |       |                      | 11/8/2019  |          | 11/13/2019   |          | 11/8/2019  |          | 11/8/2019  |          | 11/8/2019  |          | 11/12/2019  |          |
| Location Description:  |       |                      | Site 50 - NNE, upper shallow, outside site boundary, along Goose Prairie Creek bridge. |          | Site 50 - NE, upper shallow, outside site boundary, along Goose Prairie Creek. |          | Site 50 - NE, fully penetrating shallow, outside site, near Goose Prairie Creek. |          | Site 50 - NE, upper shallow, outside site boundary, along Goose Prairie Creek. |          | Site 50 - E, upper shallow, outside site boundary, east side of S. Crockett Ave. |          | Site 50 - SE, upper shallow, outside site boundary. |          |
| Parameter              | Units | MCL/PCL <sup>a</sup> | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result  | Val Qual |
| <b>PERCHLORATE</b>     |       |                      |  |          |  |          |  |          |  |          |  |          |   |          |
| Perchlorate            | µg/L  | 17 <sup>a</sup>      | < 2  | U        | 1.6  | J        | < 2  | U        | < 2  | U        | < 2  | U        | < 2   | U        |
| <b>VOLATILES</b>       |       |                      |  |          |  |          |  |          |  |          |  |          |   |          |
| 1,1-Dichloroethene     | µg/L  | 7                    | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| 1,2-Dichloroethane     | µg/L  | 5                    | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| cis-1,2-Dichloroethene | µg/L  | 70                   | 5.5  |          | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| Tetrachloroethene      | µg/L  | 5                    | 2.1  |          | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| Trichloroethene        | µg/L  | 5                    | <b>7.2</b>   |          | 1.5  |          | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| Vinyl chloride         | µg/L  | 2                    | 1.7  |          | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        |
| <b>GASES</b>           |       |                      |  |          |  |          |  |          |  |          |  |          |   |          |
| Carbon dioxide         | µg/L  | NV                   |  |          | 26000  |          |  |          |  |          |  |          | 79000   |          |
| Ethane                 | µg/L  | NV                   |  |          | < 0.47   | U        |  |          |  |          |  |          | < 0.47  | U        |
| Ethylene               | µg/L  | NV                   |  |          | < 0.55   | U        |  |          |  |          |  |          | < 0.55  | U        |
| Methane                | µg/L  | NV                   |  |          | 3  |          |  |          |  |          |  |          | 0.55  | J        |
| <b>GEN CHEMISTRY</b>   |       |                      |  |          |  |          |  |          |  |          |  |          |   |          |
| Chloride               | mg/L  | NV                   |  |          | 6.07   |          |  |          |  |          |  |          | 773   |          |
| Nitrate                | mg/L  | 10                   |  |          | < 0.1  | U        |  |          |  |          |  |          | < 0.1   | U        |
| Sulfate                | mg/L  | NV                   |  |          | 28.7   |          |  |          |  |          |  |          | 587   |          |
| Total organic carbon   | mg/L  | NV                   |  |          | 1.05   |          |  |          |  |          |  |          | 1.01  |          |

**Notes:**

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

**LHAAP-50 Year 6 Annual RA(O) Sampling  
November 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |                      | 50WW23   |          | 50WW24   |          | 50WW27  |          | 50WW29                       |          |
|--|-------|----------------------|--|----------|--|----------|---|----------|------------------------------|----------|
|  |       |                      | 50WW23-191113                                      |          | 50WW24-191108  |          | 50WW27-191108   |          | 50WW29-191111                |          |
|  |       |                      | 11/13/2019   |          | 11/8/2019  |          | 11/8/2019   |          | 11/11/2019                   |          |
|  |       |                      | Site 50 - E, upper shallow, outside site boundary. |          | Site 50 - ENE, upper shallow, outside site boundary. |          | Site 50 - N, upper shallow, outside site boundary, east of S. Crockett Ave. |          | Site 50 - ENE, upper shallow |          |
| Parameter  | Units | MCL/PCL <sup>a</sup> | Result   | Val Qual | Result   | Val Qual | Result  | Val Qual | Result                       | Val Qual |
| <b>PERCHLORATE</b>   |       |                      |  |          |  |          |   |          |                              |          |
| Perchlorate  | µg/L  | 17 <sup>a</sup>      | < 2  | U        | < 2  | U        | < 2   | U        | < 2                          | U        |
| <b>VOLATILES</b>   |       |                      |  |          |  |          |   |          |                              |          |
| 1,1-Dichloroethene   | µg/L  | 7                    | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        | < 0.5                        | U        |
| 1,2-Dichloroethane   | µg/L  | 5                    | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        | < 0.5                        | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70                   | < 0.5  | U        | < 0.5  | U        | 0.92  | J        | < 0.5                        | U        |
| Tetrachloroethene  | µg/L  | 5                    | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        | < 0.5                        | U        |
| Trichloroethene  | µg/L  | 5                    | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        | < 0.5                        | U        |
| Vinyl chloride   | µg/L  | 2                    | < 0.5  | U        | < 0.5  | U        | < 0.5   | U        | < 0.5                        | U        |
| <b>GASES</b>   |       |                      |  |          |  |          |   |          |                              |          |
| Carbon dioxide   | µg/L  | NV                   | 190000   |          |  |          |   |          |                              |          |
| Ethane   | µg/L  | NV                   | < 0.47   | U        |  |          |   |          |                              |          |
| Ethylene   | µg/L  | NV                   | < 0.55   | U        |  |          |   |          |                              |          |
| Methane  | µg/L  | NV                   | < 1  | U        |  |          |   |          |                              |          |
| <b>GEN CHEMISTRY</b>   |       |                      |  |          |  |          |   |          |                              |          |
| Chloride   | mg/L  | NV                   | 1290   |          |  |          |   |          |                              |          |
| Nitrate  | mg/L  | 10                   | 0.104  |          |  |          |   |          |                              |          |
| Sulfate  | mg/L  | NV                   | 181  |          |  |          |   |          |                              |          |
| Total organic carbon   | mg/L  | NV                   | 0.2  | J        |  |          |   |          |                              |          |

**Notes:**

a - Texas Risk Reduction Program (TRRP) Tier 1 Residential Protective Concentration Level (PCL) for groundwater

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

**LHAAP-67 Year 6 Annual RA(O) Sampling  
October 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |     | 67WW01                                 |          | 67WW02                              |          | 67WW05                                |          | 67WW07                              |          |
|--|-------|-----|--|----------|-------------------------------------|----------|---------------------------------------|----------|-------------------------------------|----------|
|  |       |     | 67WW01-191024                          |          | 67WW02-191024                       |          | 67WW05-191024                         |          | 67WW07-191028                       |          |
|  |       |     | 10/24/2019                             |          | 10/24/2019                          |          | 10/24/2019                            |          | 10/28/2019                          |          |
|  |       |     | Site 67-Central, within site boundary. |          | Site 67 - NW, within site boundary. |          | Site 67 - WNW, outside site boundary. |          | Site 67 - E, outside site boundary. |          |
| Parameter  | Units | MCL | Result                                 | Val Qual | Result                              | Val Qual | Result                                | Val Qual | Result                              | Val Qual |
| <b>VOLATILES</b>   |       |     |  |          |                                     |          |                                       |          |                                     |          |
| 1,1,1-Trichloroethane  | µg/L  | 200 | < 0.5                                  | U        | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| 1,1,2-Trichloroethane  | µg/L  | 5   | 0.53                                   | J        | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| 1,1-Dichloroethene   | µg/L  | 7   | <b>70</b>                              |          | <b>34</b>                           |          | < 0.5                                 | U        | < 0.5                               | U        |
| 1,2-Dichloroethane   | µg/L  | 5   | <b>7.6</b>                             |          | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70  | < 0.5                                  | U        | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| Trichloroethene  | µg/L  | 5   | 0.53                                   | J        | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| Vinyl chloride   | µg/L  | 2   | < 0.5                                  | U        | < 0.5                               | U        | < 0.5                                 | U        | < 0.5                               | U        |
| <b>GASES</b>   |       |     |  |          |                                     |          |                                       |          |                                     |          |
| Carbon dioxide   | µg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| Ethane   | µg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| Ethylene   | µg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| Methane  | µg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| <b>GENERAL CHEMISTRY</b>   |       |     |  |          |                                     |          |                                       |          |                                     |          |
| Chloride   | mg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| Nitrate  | mg/L  | 10  |  |          |                                     |          |                                       |          |                                     |          |
| Sulfate  | µg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |
| Total organic carbon   | mg/L  | NV  |  |          |                                     |          |                                       |          |                                     |          |

Notes:

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

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.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

NV - No value established

**LHAAP-67 Year 6 Annual RA(O) Sampling  
October 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |     | 67WW08                           |          |                  |          | 67WW09                           |          | 67WW09A                            |          |
|--|-------|-----|----------------------------------|----------|------------------|----------|----------------------------------|----------|------------------------------------|----------|
|  |       |     | 67WW08-191028                    |          | 67WW08-191028-FD |          | 67WW09-191024                    |          | 67WW09A-191028                     |          |
|  |       |     | 10/28/2019                       |          | 10/28/2019       |          | 10/24/2019                       |          | 10/28/2019                         |          |
|  |       |     | Site 67-S, within site boundary. |          |                  |          | Site 67-S outside site boundary. |          | Site 67 - S outside site boundary. |          |
| Parameter  | Units | MCL | Result                           | Val Qual | Result           | Val Qual | Result                           | Val Qual | Result                             | Val Qual |
| VOLATILES  |       |     |                                  |          |                  |          |                                  |          |                                    |          |
| 1,1,1-Trichloroethane  | µg/L  | 200 | < 0.5                            | U        | < 0.5            | U        | < 0.5                            | U        | < 0.5                              | U        |
| 1,1,2-Trichloroethane  | µg/L  | 5   | < 0.5                            | U        | < 0.5            | U        | < 0.5                            | U        | < 0.5                              | U        |
| 1,1-Dichloroethene   | µg/L  | 7   | 63                               |          | 65               |          | < 0.5                            | U        | < 0.5                              | U        |
| 1,2-Dichloroethane   | µg/L  | 5   | 2.3                              |          | 2.4              |          | < 0.5                            | U        | < 0.5                              | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70  | < 0.5                            | U        | < 0.5            | U        | < 0.5                            | U        | < 0.5                              | U        |
| Trichloroethene  | µg/L  | 5   | < 0.5                            | U        | < 0.5            | U        | < 0.5                            | U        | < 0.5                              | U        |
| Vinyl chloride   | µg/L  | 2   | < 0.5                            | U        | < 0.5            | U        | < 0.5                            | U        | < 0.5                              | U        |
| GASES  |       |     |                                  |          |                  |          |                                  |          |                                    |          |
| Carbon dioxide   | µg/L  | NV  | 110000                           |          | 130000           |          |                                  |          |                                    |          |
| Ethane   | µg/L  | NV  | < 0.47                           | U        | < 0.47           | U        |                                  |          |                                    |          |
| Ethylene   | µg/L  | NV  | < 0.55                           | U        | < 0.55           | U        |                                  |          |                                    |          |
| Methane  | µg/L  | NV  | 2.1                              |          | 2.5              |          |                                  |          |                                    |          |
| GENERAL CHEMISTRY  |       |     |                                  |          |                  |          |                                  |          |                                    |          |
| Chloride   | mg/L  | NV  | 1890                             |          | 1920             |          |                                  |          |                                    |          |
| Nitrate  | mg/L  | 10  | < 200                            | U        | < 200            | U        |                                  |          |                                    |          |
| Sulfate  | µg/L  | NV  | 513000                           |          | 515000           |          |                                  |          |                                    |          |
| Total organic carbon   | mg/L  | NV  | 1.23                             |          | 1.38             | J        |                                  |          |                                    |          |

**Notes:**

Blue highlighted/**bold** results indicate concentrations above the MCL/PCL.

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.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCS - volatile organic compounds

NV - No value established

**LHAAP-67 Year 6 Annual RA(O) Sampling  
October 2019**

| Location Code            |       |     | 67WW10                               |          | 67WW11                              |          | 67WW12                              |          | 67WW13                              |          | 67WW14                                  |          |
|--------------------------|-------|-----|--------------------------------------|----------|-------------------------------------|----------|-------------------------------------|----------|-------------------------------------|----------|---|----------|
| Sample ID                |       |     | 67WW10-191028                        |          | 67WW11-191024                       |          | 67WW12-191028                       |          | 67WW13-191028                       |          | 67WW14-191024                           |          |
| Sample Date              |       |     | 10/28/2019                           |          | 10/24/2019                          |          | 10/28/2019                          |          | 10/28/2019                          |          | 10/24/2019                              |          |
| Location Description:    |       |     | Site 67 - SE, outside site boundary. |          | Site 67- SW, outside site boundary. |          | Site 67 - NE, within site boundary. |          | Site 67 - NE, within site boundary. |          | Site 67 - SW, outside the site boundary |          |
| Parameter                | Units | MCL | Result                               | Val Qual | Result                              | Val Qual | Result                              | Val Qual | Result                              | Val Qual | Result                                  | Val Qual |
| <b>VOLATILES</b>         |       |     |                                      |          |                                     |          |                                     |          |                                     |          |   |          |
| 1,1,1-Trichloroethane    | µg/L  | 200 | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | < 0.5                               | U        | < 0.5                                   | U        |
| 1,1,2-Trichloroethane    | µg/L  | 5   | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | 5                                   |          | < 0.5                                   | U        |
| 1,1-Dichloroethene       | µg/L  | 7   | < 0.5                                | U        | 1.9                                 |          | 17                                  |          | 640                                 |          | 7.4                                     |          |
| 1,2-Dichloroethane       | µg/L  | 5   | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | 36                                  |          | 1.5                                     |          |
| cis-1,2-Dichloroethene   | µg/L  | 70  | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | 1.8                                 |          | < 0.5                                   | U        |
| Trichloroethene          | µg/L  | 5   | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | 2.6                                 |          | < 0.5                                   | U        |
| Vinyl chloride           | µg/L  | 2   | < 0.5                                | U        | < 0.5                               | U        | < 0.5                               | U        | 0.82                                | J        | < 0.5                                   | U        |
| <b>GASES</b>             |       |     |                                      |          |                                     |          |                                     |          |                                     |          |   |          |
| Carbon dioxide           | µg/L  | NV  |                                      |          |                                     |          |                                     |          | 140000                              |          |   |          |
| Ethane                   | µg/L  | NV  |                                      |          |                                     |          |                                     |          | < 0.47                              | U        |   |          |
| Ethylene                 | µg/L  | NV  |                                      |          |                                     |          |                                     |          | < 0.55                              | U        |   |          |
| Methane                  | µg/L  | NV  |                                      |          |                                     |          |                                     |          | < 1                                 | U        |   |          |
| <b>GENERAL CHEMISTRY</b> |       |     |                                      |          |                                     |          |                                     |          |                                     |          |   |          |
| Chloride                 | mg/L  | NV  |                                      |          |                                     |          |                                     |          | 1280000                             |          |   |          |
| Nitrate                  | mg/L  | 10  |                                      |          |                                     |          |                                     |          | < 0.2                               | U        |   |          |
| Sulfate                  | µg/L  | NV  |                                      |          |                                     |          |                                     |          | 304000                              |          |   |          |
| Total organic carbon     | mg/L  | NV  |                                      |          |                                     |          |                                     |          | 1.69                                |          |   |          |

**Notes:**

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U - Undetected. The analyte was analyzed for, but not detected.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCS - volatile organic compounds

NV - No value established

**LHAAP-67 Year 6 Annual RA(O) Sampling  
October 2019**

| Location Code<br>Sample ID<br>Sample Date<br>Location Description: |       |     | 67WW15                       |          | 67WW16I                       |          | 67WW17                         |          | 67WW18                         |          |                  |          |
|--|-------|-----|------------------------------|----------|-------------------------------|----------|--------------------------------|----------|--------------------------------|----------|------------------|----------|
|  |       |     | 67WW15-191024                |          | 67WW16I-191024                |          | 67WW17-191024                  |          | 67WW18-191024                  |          | 67WW18-191024-FD |          |
|  |       |     | 10/24/2019                   |          | 10/24/2019                    |          | 10/24/2019                     |          | 10/24/2019                     |          | 10/24/2019       |          |
|  |       |     | 67-W, outside site boundary. |          | 67 - S, within site boundary. |          | 67 - NW, within site boundary. |          | 67 - N, outside site boundary. |          |                  |          |
| Parameter  | Units | MCL | Result                       | Val Qual | Result                        | Val Qual | Result                         | Val Qual | Result                         | Val Qual | Result           | Val Qual |
| VOLATILES  |       |     |                              |          |                               |          |                                |          |                                |          |                  |          |
| 1,1,1-Trichloroethane  | µg/L  | 200 | < 0.5                        | U        | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| 1,1,2-Trichloroethane  | µg/L  | 5   | 6.4                          |          | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| 1,1-Dichloroethene   | µg/L  | 7   | 640                          | J        | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| 1,2-Dichloroethane   | µg/L  | 5   | 27                           |          | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70  | 1.7                          |          | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| Trichloroethene  | µg/L  | 5   | 1.5                          |          | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| Vinyl chloride   | µg/L  | 2   | < 0.5                        | U        | < 0.5                         | U        | < 0.5                          | U        | < 0.5                          | U        | < 0.5            | U        |
| GASES  |       |     |                              |          |                               |          |                                |          |                                |          |                  |          |
| Carbon dioxide   | µg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Ethane   | µg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Ethylene   | µg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Methane  | µg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| GENERAL CHEMISTRY  |       |     |                              |          |                               |          |                                |          |                                |          |                  |          |
| Chloride   | mg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Nitrate  | mg/L  | 10  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Sulfate  | µg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |
| Total organic carbon   | mg/L  | NV  |                              |          |                               |          |                                |          |                                |          |                  |          |

**Notes:**

Blue highlighted/bold results indicate concentrations above the MCL/PCL.

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U - Undetected. The analyte was analyzed for, but not detected.

µg/L - micrograms per liter

mg/L - milligrams per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCS - volatile organic compounds

NV - No value established

## GWTP Weekly/Effluent Perchlorate Sampling -November 2019

| Location ID:<br>Sample Date: | Units | Daily<br>Maximum<br>Conc | INF pond<br>(MCL) | LH18/24-SP650_110519<br>11/5/19                              | LH18/24-<br>SP650_110519_AIX<br>11/5/19 | LH18/24-<br>SP650_111219_AIX<br>11/12/19 | LH18/24-<br>SP650_112019_AIX<br>11/20/19 | LH18/24-<br>SP650_112619_AIX<br>11/26/19 |
|------------------------------|-------|--------------------------|-------------------|--|---|--|--|--|
| Location Description         |       |                          |                   | Collected from a spigot on the discharge of effluent TK-650. |   |  |  |  |
|                              |       |                          |                   | Weekly   | Monthly EFF                             | Weekly                                   | Weekly                                   | Weekly                                   |
| Perchlorate (6850)           |       |                          |                   |  |   |  |  |  |
| Perchlorate                  | µg/L  | 589                      | 17                | < 2.0 U  | < 2.0 U                                 | < 2.0 U                                  | 11                                       | < 2.0 U                                  |

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

## GWTP Weekly Sampling - November 2019

| Location ID:<br>Sample Date:    | Units | Daily<br>Maximum<br>Conc | LH18/24-SP650_110519<br>11/5/19   | LH18/24-SP650_111219<br>11/12/19 | LH18/24-SP650_112019<br>11/20/19 | LH18/24-SP650_112619<br>11/26/19 |
|---------------------------------|-------|--------------------------|---|----------------------------------|----------------------------------|----------------------------------|
| Location Description            |       |                          | GWTP—Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly. |                                  |                                  |                                  |
| <b>Ammonia as N (350.3)</b>     |       |                          |   |                                  |                                  |                                  |
| Ammonia as N                    | mg/L  | NV                       | 13  | 7.5                              | 4.6                              | 3.5                              |
| <b>Ortho-Phosphate (365.3)</b>  |       |                          |   |                                  |                                  |                                  |
| Ortho-Phosphate                 | mg/L  | NV                       | 2.2   | 1.59                             | 0.833                            | 0.518                            |
| <b>Organic Carbon (SM5310C)</b> |       |                          |   |                                  |                                  |                                  |
| Total Organic Carbon (TOC)      | mg/L  | NV                       | 1.98  | 1.23                             | 0.90 J                           | 1.3                              |

mg/L - milligrams per liter

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues



## GWTP Bi-Weekly Sampling - November 2019

| Location ID:<br>Sample Date:              | Units | (Bayou) Daily<br>Maximum Conc | (INF pond)<br>MCL | LH18/24-SP650_111219<br>11/12/19*   | LH18/24-SP650_112619<br>11/26/19** |
|---|-------|-------------------------------|-------------------|---|------------------------------------|
| Location Description                      |       |                               |                   | GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly. |                                    |
| <b>Volatile Organic Compounds (8260C)</b> |       |                               |                   |   |                                    |
| 1,1,1-Trichloroethane                     | µg/L  | 7,230                         | 200               | < 0.50 U  | < 0.50 U                           |
| 1,1,2-Trichloroethane                     | µg/L  | 216.9                         | 5                 | < 0.50 U  | < 0.50 U                           |
| 1,1-Dichloroethane                        | µg/L  | 14,032                        | NV                | < 0.50 U  | < 0.50 U                           |
| 1,1-Dichloroethene                        | µg/L  | 253                           | 7                 | < 0.50 U  | < 0.50 U                           |
| 1,2-Dichloroethane                        | µg/L  | 181                           | 5                 | <b>2.1</b>  | <b>1.7</b>                         |
| 1,2-Dichloropropane                       | µg/L  | 5                             | 5                 | < 0.50 U  | < 0.50 U                           |
| Acetone                                   | µg/L  | 2,395                         | NV                | < 1.0 U   | < 1.0 U                            |
| Benzene                                   | µg/L  | 181                           | 5                 | < 0.50 U  | < 0.50 U                           |
| Carbon tetrachloride                      | µg/L  | 181                           | 5                 | < 0.50 U  | < 0.50 U                           |
| Chlorobenzene                             | µg/L  | 47,180                        | 100               | < 0.50 U  | < 0.50 U                           |
| Chloroform                                | µg/L  | 3,615                         | NV                | < 0.50 U  | < 0.50 U                           |
| cis-1,2-Dichloroethene                    | µg/L  | NV                            | 70                | <b>64</b>   | <b>63</b>                          |
| Ethylbenzene                              | µg/L  | 57,025                        | 700               | < 0.50 U  | < 0.50 U                           |
| m,p-Xylene                                | µg/L  | 83.6                          | NV                | < 1.0 U   | < 1.0 U                            |
| Methylene chloride                        | µg/L  | 1,699                         | 5                 | <b>16</b>   | <b>6.0</b>                         |
| o-Xylene                                  | µg/L  | 83.6                          | NV                | < 0.50 U  | < 0.50 U                           |
| Styrene                                   | µg/L  | 5,987                         | 100               | < 0.50 U  | < 0.50 U                           |
| Tetrachloroethene                         | µg/L  | 180.7                         | 5                 | < 0.50 U  | < 0.50 U                           |
| Toluene                                   | µg/L  | 4,189                         | 10                | < 0.50 U  | < 0.50 U                           |
| Trichloroethene                           | µg/L  | 181                           | 5                 | <b>12 J</b>   | <b>12</b>                          |
| Vinyl chloride                            | µg/L  | 72                            | 2                 | <b>1.7</b>  | <b>0.66 J</b>                      |
| <b>Anions (9056)</b>                      |       |                               |                   |   |                                    |
| Chloride                                  | mg/L  | NV                            | NV                | <b>528</b>  | <b>403</b>                         |
| Sulfate                                   | mg/L  | NV                            | NV                | <b>34.8</b>   | <b>33.5</b>                        |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

\*released to the Bayou; no exceedances

\*\*released to the INF pond

## GWTP Monthly Effluent Sampling - November 2019

| GWTP Monthly Effluent Sampling - November 2019 |       |                       |                |   |                              |                                 |
|--|-------|-----------------------|----------------|---|------------------------------|---------------------------------|
| Location ID:<br>Sample Date:                   | Units | Daily Maximum<br>Conc | (INF pond) MCL | LH18/24-SP650_BIX<br>11/5/19  | LH18/24-SP650_AIX<br>11/5/19 | LH18/24-SP650_110519<br>11/5/19 |
| Location Description                           |       |                       |                | GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled monthly |                              |                                 |
| Volatile Organic Compounds (8260C)             |       |                       |                |   |                              |                                 |
| 1,1,1-Trichloroethane                          | µg/L  | 7,230                 | 200            | < 0.50 U  | < 0.50 U                     | NA                              |
| 1,1,2-Trichloroethane                          | µg/L  | 216.9                 | 5              | < 0.50 U  | < 0.50 U                     | NA                              |
| 1,1-Dichloroethane                             | µg/L  | 14,032                | NV             | < 0.50 UJ   | < 0.50 U                     | NA                              |
| 1,1-Dichloroethene                             | µg/L  | 253                   | 7              | < 0.50 U  | < 0.50 U                     | NA                              |
| 1,2-Dichloroethane                             | µg/L  | 181                   | 5              | 2.8   | 1.3                          | NA                              |
| 1,2-Dichloropropane                            | µg/L  | 5                     | 5              | < 0.50 UJ   | < 0.50 U                     | NA                              |
| Acetone  | µg/L  | 2,395                 | NV             | < 1.0 U   | < 1.0 U                      | NA                              |
| Benzene  | µg/L  | 181                   | 5              | < 0.50 UJ   | < 0.50 U                     | NA                              |
| Carbon tetrachloride                           | µg/L  | 181                   | 5              | < 0.50 U  | < 0.50 U                     | NA                              |
| Chlorobenzene                                  | µg/L  | 47,180                | 100            | < 0.50 U  | < 0.50 U                     | NA                              |
| Chloroform                                     | µg/L  | 3,615                 | NV             | < 0.50 U  | < 0.50 U                     | NA                              |
| cis-1,2-dichloroethene                         | µg/L  | NV                    | 70             | 53  | 38                           | NA                              |
| Ethylbenzene                                   | µg/L  | 57,025                | 700            | < 0.50 U  | < 0.50 U                     | NA                              |
| m,p-Xylene                                     | µg/L  | 83.6                  | NV             | < 1.0 U   | < 1.0 U                      | NA                              |
| Methylene chloride                             | µg/L  | 1,699                 | 5              | 21 J  | 16                           | NA                              |
| o-Xylene                                       | µg/L  | 83.6                  | NV             | < 0.50 U  | < 0.50 U                     | NA                              |
| Styrene  | µg/L  | 5,987                 | 100            | < 0.50 U  | < 0.50 U                     | NA                              |
| Tetrachloroethene                              | µg/L  | 180.7                 | 5              | < 0.50 U  | < 0.50 U                     | NA                              |
| Toluene  | µg/L  | 4,189                 | 10             | < 0.50 U  | < 0.50 U                     | NA                              |
| Trichloroethene                                | µg/L  | 181                   | 5              | 15  | 7.1                          | NA                              |
| Vinyl chloride                                 | µg/L  | 72                    | 2              | < 0.50 U  | 0.87 J                       | NA                              |
| Metals (6020A)                                 |       |                       |                |   |                              |                                 |
| Barium   | mg/L  | 2                     | 2              | NA  | NA                           | 0.214                           |
| Lead   | mg/L  | 0.0046                | 0.015          | NA  | NA                           | < 0.00100 U                     |
| Selenium                                       | mg/L  | 0.012                 | 0.05           | NA  | NA                           | < 0.00250 U                     |
| Silver   | mg/L  | 0.003                 | 0.1            | NA  | NA                           | < 0.000500 U                    |
| Hexavalent Chromium (7196A)                    |       |                       |                |   |                              |                                 |
| Hexavalent Chromium                            | mg/L  | 0.1244                | NA             | NA  | NA                           | < 0.0100 U                      |
| Semi-Volatile Organic Compounds (8270D SIM)    |       |                       |                |   |                              |                                 |
| 1,4-Dioxane                                    | µg/L  | 134.2                 | NA             | NA  | NA                           | 11                              |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

BIX - before ion exchange vessel

AIX - after ion exchange vessel

NA - not analyzed

\*released to Harrison Bayou; no exceedances

### GWTP Monthly Influent Sampling - November 2019

|                              |       |   |
|------------------------------|-------|---|
| Location ID:<br>Sample Date: | Units | LH18/24-SP140_110519<br>11/5/19   |
| Location Description         |       | GWTP – Collected from a spigot on the<br>influent to TK-140. Sampled Monthly. |
| Metals (6020A)               |       |   |
| Selenium                     | mg/L  | < 0.00250 U   |
| Silver                       | mg/L  | < 0.000500 U  |
| Hexavalent Chromium (7196A)  |       |   |
| Hexavalent Chromium          | mg/L  | < 0.0100 U  |
| Perchlorate (6850)           |       |   |
| Perchlorate                  | µg/L  | 10,000  |

mg/L - milligrams per liter

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.



**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: October 23, 2019, 6:00 PM Central Daylight Time (CDT)**

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**Meeting Participants:**

|                 |   |
|-----------------|---|
| Army BRAC:      | Rose M. Zeiler  |
| USACE:          | Aaron Williams  |
| USAEC:          | Amanda Sherman and Troy Darr  |
| Bhate:          | Kim Nemmers   |
| APTIM:          | Bill Foss   |
| USEPA Region 6: | Rich Mayer, Dorelle Harrison, and Kent Becher (KB)-USGS Liaison   |
| TCEQ:           | April Palmie  |
| RAB:            | Present: Judy VanDeventer, Deon Hall, John Fortune, Charles Dixon,<br>Richard LeTourneau, and Sharron McAvoy<br>Absent: Nigel R. Shivers, Carol Fortune; Terry Britt; John Pollard, Jr.; Tom Walker |
| Public:         | Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute [CLI])  |

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An agenda for the RAB meeting, a color copy of the Bhate Environmental Associates, Inc. (Bhate) slide presentation, and handouts (see list at end of meeting minutes) were provided for meeting attendees.

**Welcome and Introduction**

Ms. Rose Zeiler, RAB Installation Co-Chair, called the RAB meeting to order at 6:05 pm CDT. Ms. Zeiler welcomed everyone and asked if there was anyone present that had not attended before. Mr. Troy Darr stated that he was from the U.S. Army Environmental Command (USAEC) Public Affairs office and that he is in training to support environmental restoration. Mr. Darr stated that he also came to assist a person from the University of North Texas (UNT) in case he was at the meeting to shoot some video. However, the person from UNT was not at the meeting.

Ms. Zeiler explained the RAB meets every 3 months and that the purpose is to promote community awareness and obtain constructive community review and comments on environmental restoration activities. Ms. Zeiler stated that the Army is committed to protecting human health and the environment. Ms. Zeiler stated the importance of engaging the community and increasing public participation in the RAB. Ms. Zeiler explained that the RAB is expected to inform the community and hear the concerns. Ms. Zeiler asked if anyone had heard from John Pollard, one of the RAB members, who had not attended a meeting in the past year. Ms. Zeiler stated that she probably needed to send him a letter to find out if he was still interested in being on the board. Ms. Zeiler stated to let her know if anyone knew of someone interested in being on the RAB board also.



Ms. Zeiler stated that Paul Fortune had stepped down as RAB co-chair and the RAB needed to select a new co-chair. Ms. Zeiler then handed out sheets of paper with the names of each of the RAB members. Ms. Zeiler asked the RAB members present to select their 1<sup>st</sup> and 2<sup>nd</sup> choices for RAB co-chair and then hand them to Mr. Aaron Williams for tally. Ms. Zeiler explained the role of the new co-chair is speak for the RAB, generally starts the meeting and coordinate opinions from RAB members. Ms. Zeiler stated that concerns or issues by the public or other RAB members (e.g. frequency of RAB meeting) should be brought to the RAB co-chair.

### **Defense Environmental Restoration**

Ms. Kim Nemmers stated that the RAB meeting slides were available along with handouts for the groundwater treatment plant (GWTP) and surface water samples. Ms. Nemmers pointed out that the slide packet contains a map of the installation sites along with a list of abbreviations and acronyms for reference.

#### LHAAP-50

Mr. Bill Foss presented LHAAP-50 and explained that the site is a small site south of LHAAP-47. Mr. Foss explained the site history for LHAAP-50, including that a remedy has been in place since the Record of Decision (ROD) was signed in 2010. Mr. Foss stated that the remedy has been monitored since that time. Mr. Foss explained that the site had a 47,000 gallon aboveground storage tank that received industrial waste water from sumps throughout LHAAP from the 1950s through the late 1980s. Mr. Foss stated that the constituents of concern were chlorinated solvents and perchlorate in groundwater and perchlorate in soil. Mr. Foss indicated that the remedy selected was monitored natural attenuation (MNA) for the groundwater, excavation of soil contamination that could leach into the groundwater, and land use controls (LUCs). The ROD also had a contingency remedy of enhanced in-situ bioremediation (EISB) if the MNA was not effective.

Mr. Foss explained that MNA was found to be ineffective based upon lines of evidence (in a process developed by the U.S. Environmental Protection Agency [USEPA]) in 2018 following years of groundwater monitoring. Mr. Foss explained that the concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018. Based upon these increasing concentrations and other lines of evidence, Mr. Foss explained that the Army, Texas Commission on Environmental Quality (TCEQ), and USEPA agreed that the contingency remedy was needed to address the site plumes. Mr. Foss stated that initiation of the contingency remedy was documented in the Explanation of Significant Differences (ESD), which was co-signed by the USEPA and received concurrence from TCEQ.

Mr. Foss explained that, due to the expansion of the plume, an additional well was installed in July 2019. Mr. Foss stated that the groundwater collected from the new monitoring well did not have TCE or perchlorate above the screening levels such that the plume extent is now smaller than previously depicted. Mr. Foss stated that the Remedial Action Work Plan (RAWP) is being prepared to implement the contingency remedy. Mr. Foss stated that the remedy planned is injection of emulsified vegetable oil (EVO) along with microbial culture to enhance the degradation process of TCE and perchlorate. Mr. Foss stated that the goal is to treat the most



impacted portions of the plume. Mr. Foss stated that the implementation is planned for later 2019 or early 2020 depending on the time to get the RAWP approved by the USEPA and TCEQ.

### Overview of Sites

Ms. Nemmers discussed the field work completed the previous 3 months. She explained that the area had received a large amount of rainfall for an extended period of time and that this has delayed implementation of several remedies until the past 3 months. Ms. Nemmers stated that remedies are being implemented at LHAAP-03, -04, -16, and -17. Ms. Nemmers stated that bioremediation approaches, similar to what Mr. Foss presented for LHAAP-50, were being implemented at LHAAP-04 and LHAAP-16. Ms. Nemmers stated that soil excavation was being completed at LHAAP-03 and LHAAP-17. Ms. Nemmers stated that monitoring of the selected remedy has occurred at LHAAP-37, LHAAP-58, and LHAAP-18/24. Ms. Nemmers stated that new monitoring wells were installed at LHAAP-12, -16, -50, and -67 to confirm delineation of the site plumes. Ms. Nemmers stated that the extraction system, installed at LHAAP-18/24, has double-walled piping to transfer the extracted groundwater to the treatment plant. Based upon observed leaks, replacement of portions of this double-walled piping has been completed.

### LHAAP-16

For LHAAP-16, Mr. Foss explained the site has perchlorate and TCE impacted groundwater similar to LHAAP-50, which he presented earlier. Mr. Foss then pointed out the location of the site. Mr. Foss explained that the plume emanates from a former landfill towards the bayou. Mr. Foss explained that the site had an extraction system for the plume. When LHAAP lost power in late December 2018, the outage continued into late August 2019 and the extraction system did not operate. Mr. Foss explained that when power was restored in August, the extraction system was operated for a couple of weeks and then the sampling was completed in September 2019 to confirm the October 2018 baseline results. Mr. Foss explained that two monitoring wells were installed on the east side of the Harrison Bayou at the beginning of August 2019. Ms. Zeiler stated that the installation of these wells was difficult and took a long time to get proper conditions for installation. Ms. Zeiler said that these wells were necessary to evaluate the performance of the remedy being implemented and determine if there was TCE across the Bayou in the groundwater.

Mr. Foss stated that injections have started at the site. Mr. Foss explained that the injections started with the Bayou Biobarrier, pointing out the location of this area on slide 13. Mr. Foss also pointed out the two new wells installed on slide 13 (16WW57 and 16WW58). Mr. Foss stated that these wells allow for evaluation of the plume along the downgradient edge. Mr. Foss explained that the area in yellow includes injection of EVO in a grid pattern using direct push technology (DPT) with recirculation to treat this area of elevated perchlorate and TCE. Mr. Foss explained that Biobarriers 1 and 3 have also used DPT for delivery of the EVO. Mr. Foss explained that Biobarrier 2 does not require DPT so the DPT rig has moved over to LHAAP-04. Mr. Richard LeTourneau asked if this site will respond better than others. Mr. Foss stated that everything went in well but the first round of groundwater monitoring, completed after all the injections are done, will help assess the performance. Ms. Laura-Ashley Overdyke asked about the data from the new wells. Mr. Foss stated that the groundwater results from the new wells will be presented in the Remedial Action Completion Report (RACR) that will be produced in 2020. Ms. Zeiler stated



that the groundwater results show that the TCE plume crosses the bayou and will be used to evaluate the effectiveness of the injections. Ms. Zeiler stated that surface water sampling will continue and that contamination is not being observed downgradient of the site. Ms. Zeiler pointed out that the field team is checking for injectate in the bayou which could be observed as a white milky material and could take away oxygen in surface water. Ms. Nemmers pointed out that the initial groundwater sampling results may not be representative of whether the site responds well because often it takes a year to observe microbial growth resulting in reduction of the TCE and perchlorate. Ms. Zeiler pointed out that the yellow area, shown on Slide 13 for LHAAP-16, is where the extraction system was located, which is now turned off, and that the area is a treatment area and not a barrier. High concentrations of TCE are found in the area in both the shallow and intermediate zone groundwater. Ms. Zeiler explained that a grid of injections is used in the shallow zone of the ISB treatment area to treat the contamination and existing extraction wells are used in the intermediate zone to recirculate injectate to get as much contact as possible with the TCE contamination in that zone. Ms. Zeiler pointed out that with the landfill being the source of the plume, additional injections will likely be needed in the future along the landfill biobarriers.

#### LHAAP-17

Mr. Foss explained that LHAAP-17 is located across the Bayou and southeast of LHAAP-16. Mr. Foss stated that LHAAP-17 was a burning ground and flashing site. Mr. Foss explained that the site was excavated beginning in August 2019 for explosives in the soil and that approximately 5,300 cubic yards of soil was expected to be removed. However, munition items were found during the excavation, which was unanticipated. The Army provided Ordnance and Explosives Safety Specialist (OESS) support. Mr. Foss stated that the initial rounds found were not live so the excavation continued under OESS supervision. Mr. Foss stated that the excavation was nearly completed but then additional munitions debris and munitions and explosives of concern (MEC) were found. Therefore, work has been stopped to be able to provide additional ordnance support and ensure safety of intrusive activities. Mr. Foss explained that as a safety measure the currently excavated areas will be backfilled in early November 2019.

Mr. Foss explained that the second part of the remedy involves the installation of a groundwater extraction system to treat perchlorate in groundwater. Mr. Foss stated that placement of that system will be above ground to avoid intrusive activities. Mr. Foss explained that this will allow the remedy to move forward. Ms. Judy VanDeventer asked if the remaining excavation will be done under this contract. Ms. Zeiler stated that the work will be under a separate contract. Mr. Foss stated that a report will be prepared to document the excavation and backfilling work completed at the site to date to support the scoping of follow-on excavation work. Ms. Nemmers pointed out that the dashed lines on slide 16 show the extent of the excavation. Ms. Nemmers stated that over excavation was necessary for some sidewalls as shown by dashed lines that move away from the planned excavation and that most of the planned excavation was completed.

#### Look Ahead

Ms. Nemmers then discussed the 3 month look ahead for LHAAP field work. Ms. Nemmers stated that the documents in the coming months include annual Remedial Action Operations [RA(O)]



Reports that document the progress of the remedies implemented. Ms. Nemmers stated that the RAWP for the injections at LHAAP-50 is going through the review process as previously discussed. Ms. Nemmers stated that the quarterly evaluation reports for the GWTP are in process for the second and third quarter of 2019.

Ms. Nemmers stated that the field work look ahead includes the four sites discussed throughout the meeting. Ms. Nemmers stated that LHAAP-03 is a small site with arsenic and lead in the soil that requires a little additional excavation based upon the soil sample results and then backfilling. Ms. Nemmers stated that LHAAP-17 field work will hopefully include installation of the extraction system in addition to backfilling the excavation. Ms. Nemmers stated that the injections will be completed at LHAAP-04 and LHAAP-16 in the coming weeks and then the sites will enter the performance monitoring phase. Ms. Nemmers stated that the other sites listed on slide 18 are the sites with remedies in place that have on-going RA(O) sampling. Ms. Zeiler reminded everyone that the field schedules are posted on the website and encouraged everyone to check for this information. Ms. Nemmers pointed out that the look ahead for documents is the same list that are currently being completed because the documents take time to get reviewed and approved. Ms. Zeiler pointed out that the Contingency RAWP is the document for the injection field work at LHAAP-50, discussed early on in the meeting.

#### Groundwater Treatment Plant

Ms. Nemmers stated that there were handouts with the information on the slides for the GWTP that provide more details. Ms. Nemmers pointed out that the chart depicts discharge of treated water that includes water from the INF Pond so the peaks and valleys of the chart indicate discharge to the Bayou from both the GWTP and the INF Pond if able. Ms. Nemmers explained that when the Bayou is not flowing that the treated groundwater is discharged to the INF Pond. Ms. Nemmers also stated that more water can be extracted from the ground when there is more precipitation. Mr. Charles Dixon asked if the purpose of discharging in this way was to keep the minerals low. Ms. Zeiler stated that chloride and sulfate is tested prior to discharge to the Bayou.

#### Surface Water Sampling

Ms. Nemmers presented the five locations sampled for surface water. Ms. Nemmers stated that surface water samples are collected on a quarterly basis when the Bayou is flowing. Ms. Nemmers explained that one of the surface water samples exceeded the screening criteria of 17 parts per billion (ppb) for perchlorate. Ms. Nemmers stated that the surface water location was resampled a couple of weeks later. Ms. Nemmers stated that the result from the resample was 1.2 J ppb, with J meaning that the result was estimated. Ms. Nemmers explained that the detection limit is typically 2 ppb and so the detection was seen by the laboratory but below the detection limit. Ms. Nemmers stated that the location of the surface water sample was the furthest downgradient sample location but has historically had detections of perchlorate. Ms. Nemmers stated that LHAAP-18/24 was sampled in this same time period and that monitoring wells upgradient of this surface water sample did not have detections of perchlorate. Ms. Nemmers stated that the surface water will be sampled in the fourth quarter but has not been sampled in October 2019 to date due to lack of surface water flow. Ms. Zeiler pointed out that the screening criteria is the groundwater drinking level. Ms. Nemmers stated that this





information is also provided in a handout.

LHAAP-18/24, LHAAP-29, and LHAAP-47

Mr. Williams explained that HDR, Inc., has a separate contract for sites that do not have a ROD and is responsible for selection of the final remedy at three sites (LHAAP-18/24, LHAAP-29, and LHAAP-47). Mr. Williams explained that the LHAAP-18/24 ROD is being reviewed by the regulators and that comments are expected later in October 2019. Mr. Williams hoped that the ROD could be signed in late 2019.

Mr. Williams stated that the Final ROD for LHAAP-29 was signed and is on compact disc (CD) at the Marshall Public Library. On October 13, 2019, Mr. Williams stated that the notice that the final ROD was available for review was put into the Marshall News Messenger and the Shreveport Times.

Mr. Williams stated that LHAAP-47 had old data so additional data was obtained. A new well installed had an elevated detection of TCE such that the remedy selected would not be effective at those high levels. Currently, Work Plan Addendum 2 is being completed. The additional investigation planned will focus on the area around monitoring well 47MW25R. Monitoring well 47MW25R had TCE detected at 120,000 ppb. Mr. Williams explained the field work planned included both soil and groundwater samples.

Ms. Overdyke asked if LHAAP-17 excavation could have contributed to the perchlorate detected in HBW-7. Ms. Zeiler stated that the excavation commenced after the surface water sampling was completed. Ms. Zeiler stated that groundwater results and water levels were evaluated but no reason for the detection could be identified. Ms. Zeiler pointed out that implementation of the remedies such as at LHAAP-18/24 makes the Army feel better about the overall progress at this site.

**Next RAB Meeting Schedule and Closing Remarks**

Ms. Zeiler then discussed the next meeting with the RAB members. It was decided that the next RAB Meeting will be held on **January 16, 2020**, with the **meeting starting at 6:00 pm Central Standard Time (CST)** at the Karnack Community Center.

Ms. Zeiler announced that Ms. VanDeventer was selected as the new co-chair. Ms. VanDeventer accepted the position. Mr. Kent Becher mentioned that Mr. Rich Mayer was retiring. Mr. Mayer said that he had been at the USEPA since January 1987 and will be retiring on December 31, 2019. Mr. Mayer stated that he's been with the EPA since January 1987. Mr. Mayer said that he had been reviewing documents, like those for LHAAP, for 33 years. Mr. Mayer said that he'd enjoyed working with the RAB and that a replacement had not yet been selected for him by the EPA.

**Adjourn**

Ms. VanDeventer made the motion to adjourn and Mr. Dixon seconded the motion. The meeting adjourned at 6:55 pm CDT.



**October 2019 Meeting Attachments and Handouts:**

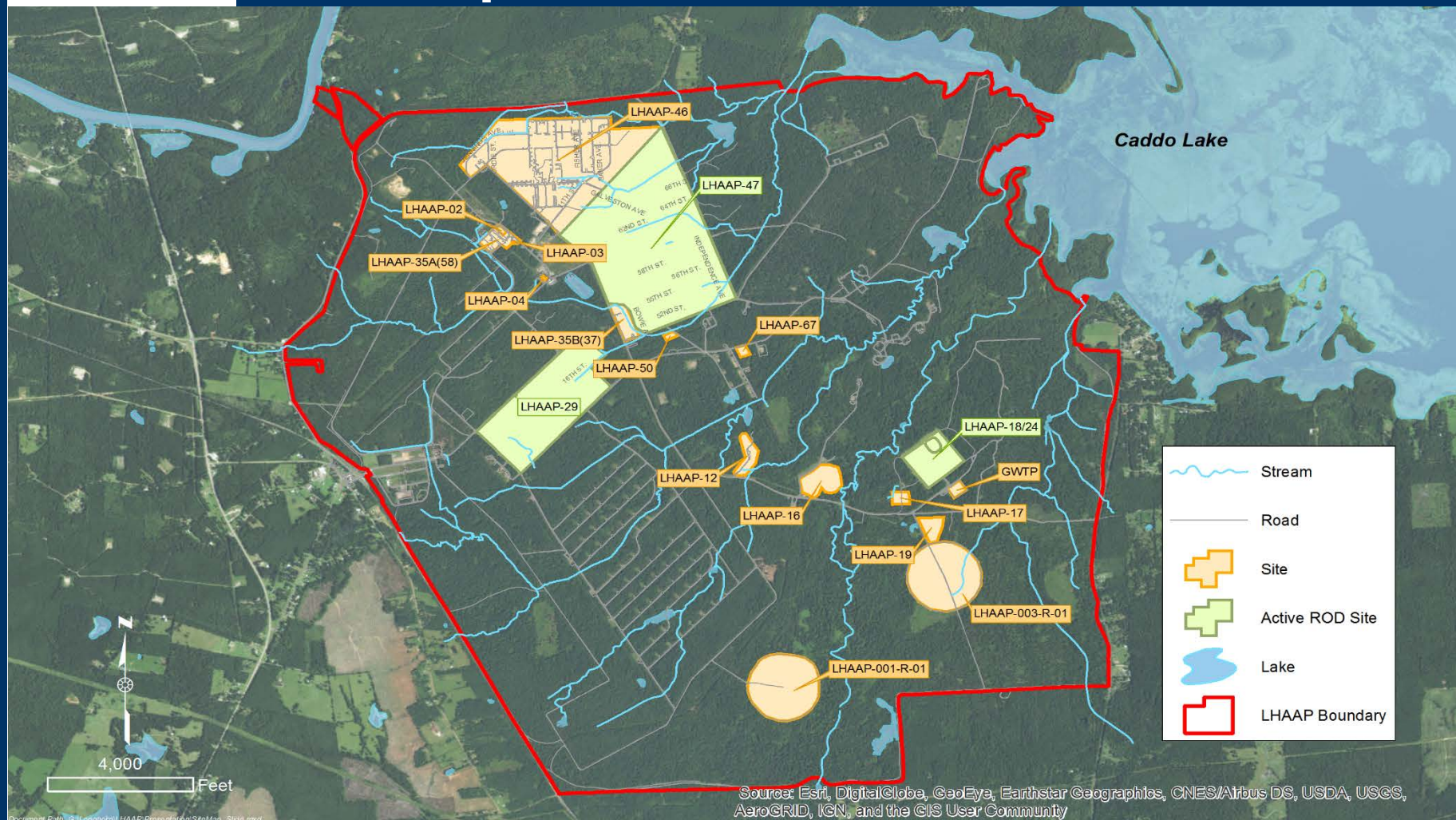
- Color Copy of Bhate Presentation Slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout

# **Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting**

**Karnack Community Center  
October 23, 2019  
6:00 PM CDT**

# Restoration Advisory Board Meeting

## Site Map



## Abbreviations and Acronyms

|        |   |
|--------|---|
| µg/L   | Micrograms per liter                      |
| DERP   | Defense Environmental Restoration Program |
| DPT    | Direct Push Technology                    |
| ESD    | Explanation of Significant Differences    |
| GPW    | Goose Prairie Creek Water Sample          |
| GW-Res | Residential Groundwater                   |
| GWTP   | Groundwater Treatment Plant               |
| HBW    | Harrison Bayou Water Sample               |
| ISB    | In-situ bioremediation                    |
| LHAAP  | Longhorn Army Ammunition Plant            |
| MEC    | Munitions and Explosives of Concern       |

|       |   |
|-------|---|
| MNA   | Monitored natural attenuation             |
| PCL   | Protective Concentration Level            |
| PSI   | Pre-Screening Investigation               |
| RAB   | Restoration Advisory Board                |
| RA(O) | Remedial Action Operation                 |
| RAWP  | Remedial Action Work Plan                 |
| ROD   | Record of Decision                        |
| TCE   | Trichloroethylene                         |
| TCEQ  | Texas Commission on Environmental Quality |
| TRRP  | Texas Risk Reduction Program              |
| USEPA | U.S. Environmental Protection Agency      |



## Agenda

- 06:00 Welcome and Introduction
- 06:05 Open Items
- Purpose of the Restoration Advisory Board (RAB) Meeting
  - Ongoing Outreach/Website
  - RAB Administrative Issues
    - Membership Update
    - Minutes (July 2019 RAB Meeting)
    - Election of new Co-Chair
- 06:15 Defense Environmental Restoration Program (DERP) Update
- LHAAP-50 Remedial Action Work Plan (RAWP)
  - Documents and Field Work Completed Since Last RAB
    - LHAAP-16
    - LHAAP-17
  - 3 Month Look Ahead
  - Groundwater Treatment Plant (GWTP) Update
- 06:45 Other DERP Update
- LHAAP-18/24 Record of Decision (ROD) and Responsiveness Summary
    - LHAAP-29 ROD and Responsiveness Summary
    - LHAAP-47 Additional Pre-Screening Investigation (PSI) Data & Revised ROD Schedule
    - Five Year Review Update – Recommendations for Sites 12, 50, and 67
- 06:55 Next RAB Meeting Schedule and Closing Remarks {RMZ}

## Purpose of the RAB Meeting

- Held every 3 months
- The mission of the Longhorn Army Ammunition Plant (LHAAP) RAB is to promote community awareness and obtain constructive community review and comments on environmental restoration activities at the former LHAAP

## The Army Wants You to be Informed

- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at LHAAP
- You are encouraged to:
  - Attend RAB Meetings and/or become a member of the RAB
  - Visit the Longhorn environmental website at [www.longhornaap.com](http://www.longhornaap.com)
    - Website is regularly updated to indicate the upcoming field events at each site including groundwater sampling, monitoring well installations, soil sampling, or remediation activities
  - Make suggestions for improving communication – the Army welcomes and appreciates community feedback



## RAB Administrative Issues

- **Membership Update**
- **Minutes (July 2019 RAB Meeting)**
- **Election of new Co-Chair**

## LHAAP-50 Contingency RAWP

- **Site Background**
  - LHAAP-50 had a 47,000-gallon aboveground storage tank receiving industrial wastewater from various production sumps throughout LHAAP between 1955 and 1988.
  - After solids were filtered, the water was discharged to Goose Prairie Creek.
  - Constituents of concern at LHAAP-50 were chlorinated solvents and perchlorate in groundwater and perchlorate in soil.
  - The selected remedy in the 2010 ROD was monitored natural attenuation (MNA), excavation of soil to eliminate groundwater contamination from contaminated soil, and land use controls as the remedy for groundwater. The ROD also included a contingency remedy for groundwater if MNA was not effective.



## LHAAP-50 Contingency RAWP

- **Site Background-Continued**
  - In 2018, MNA was found to be ineffective based on evaluation of several lines of evidence.
  - Concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018, and the TCE plume has expanded beyond its baseline footprint.
  - Final Explanation of Significant Differences (ESD) to the ROD for a contingency remedy was published in July 2019 and co-signed by the U.S. Environmental Protection Agency (USEPA) and Army and concurred by Texas Commission on Environmental Quality (TCEQ) in August 2019.
  - In July 2019, one additional monitoring well (50WW29) was installed and sampled.
  - Sample results confirmed the extent of the TCE and perchlorate plumes in groundwater.

## LHAAP-50 Contingency RAWP Continued

### Contingency RAWP

- RAWP is still in development and will undergo USEPA and TCEQ review and concurrence before implementation.
- The RAWP will include injection of emulsified vegetable oil, a microbial culture (SDC-9™), and nutrients to enhance biological degradation of perchlorate and TCE hot spots.
- Monitoring of the contingency remedy will include quarterly performance monitoring of selected wells for 2 years, as well as continued long-term monitoring of the larger plume area.
- Implementation of the Contingency RAWP is anticipated in late 2019.

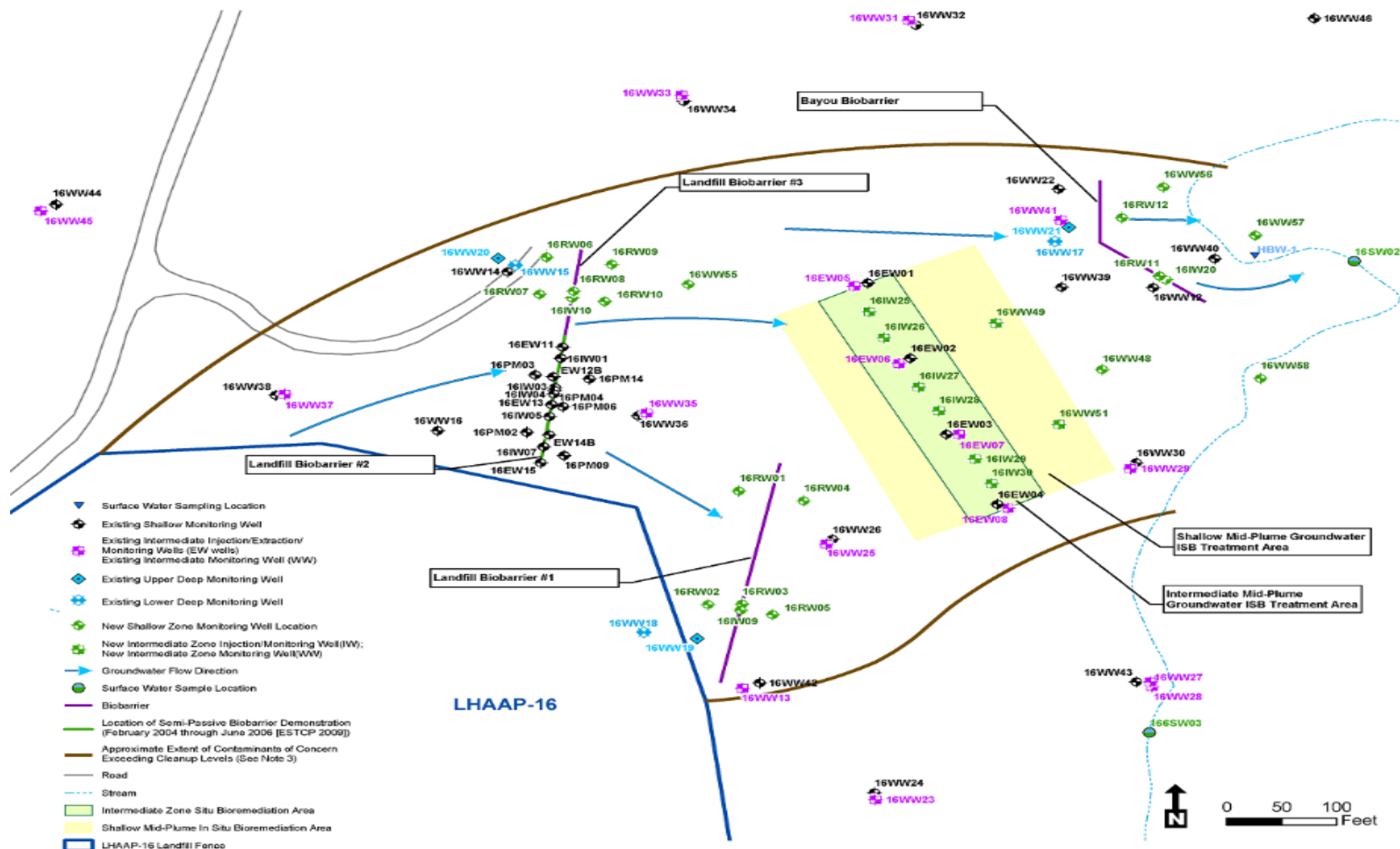
## Completed Field Work Since Last RAB Meeting

| Site              | Activity  |
|-------------------|---|
| LHAAP-03          | Implementation of Remedial Action (Soil Excavation)                         |
| LHAAP-04          | Implementation of Remedial Action (In-situ bioremediation [ISB] Injections) |
| LHAAP-16          | Implementation of Remedial Action (ISB Injections)                          |
| LHAAP-17          | Implementation of Remedial Action (Soil Excavation)                         |
| LHAAP-37          | Remedial Action Operation [RA(O)] Sampling – August 2019                    |
| LHAAP-46          | RA(O) Sampling – August 2019  |
| LHAAP-58          | RA(O) Sampling of Western Plume – September 2019                            |
| LHAAP-18/24       | RA(O) Sampling – Maintenance/repairs  |
| LHAAP-12/16/50/67 | Installation of New Monitoring Wells  |

## LHAAP-16 Remedial Action Update

- Power restored to site in late August 2019 and extraction system restarted.
- Two wells on east side of Harrison Bayou (16WW57 & 16WW58) and one remaining intermediate zone well (16WW49) installed in July/August 2019
- Baseline samples collected from selected wells in September 2019 to complement October 2018 Baseline Sampling
- Injections completed in the Bayou Biobarrier, Mid-Plume Area, Biobarrier #1, Biobarrier #2, and Biobarrier #3
- 80,874 gallons of ISB solution injected starting on September 24, 2019 with 102 injection locations

# LHAAP-16 Remedial Action Update



## LHAAP-17 Remedial Action Update

- Excavation of contaminated soil initiated on August 21, 2019
- During excavation, unanticipated munitions items were discovered and addressed by Army Explosive Ordnance Disposal teams
- Excavation continued with support from an Army Ordnance and Explosives Safety Specialist
- Approximately 6,000 cubic yards of soil was excavated between August 21 and September 28, 2019

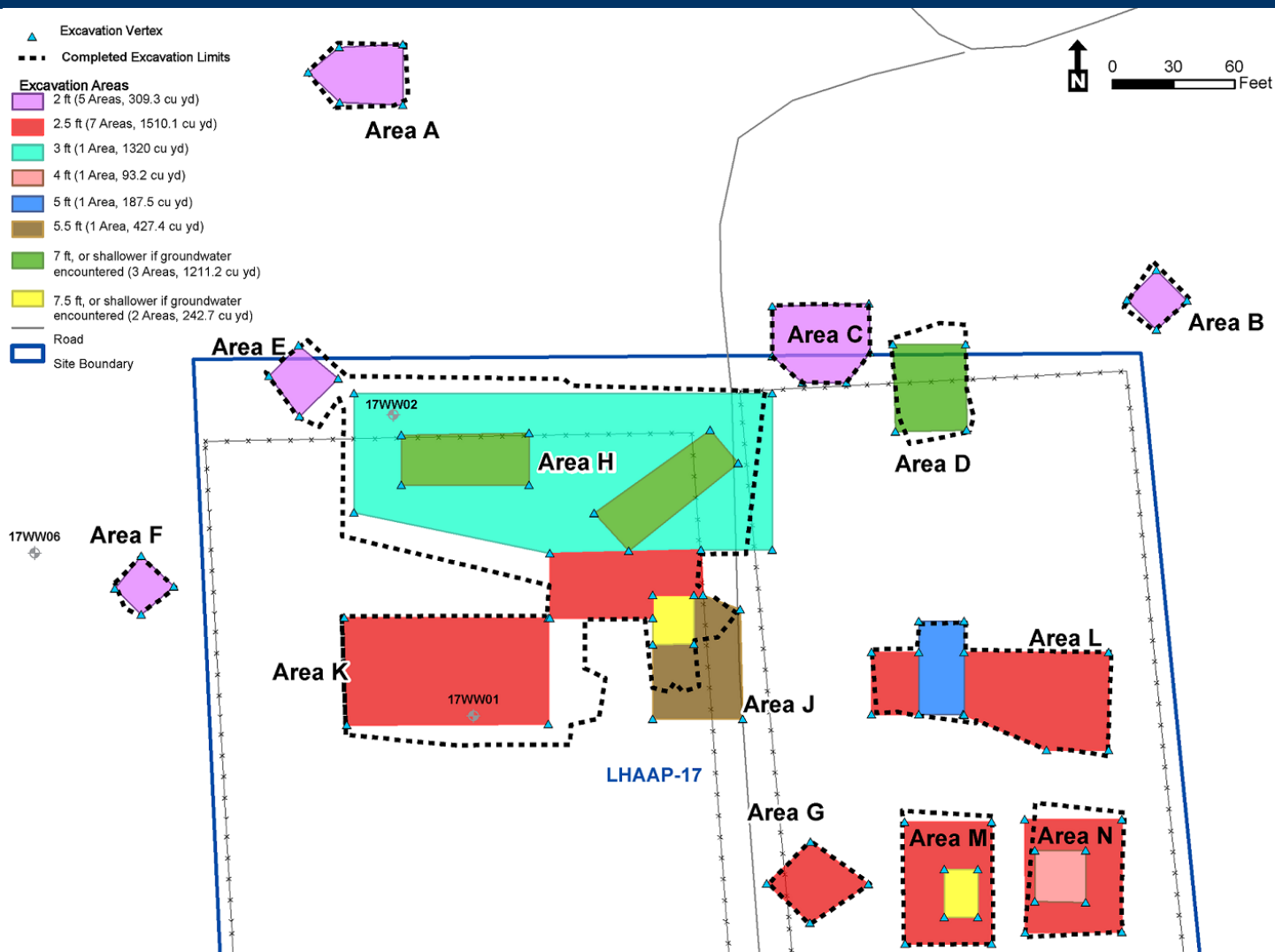


## LHAAP-17 Remedial Action Update

- On September 28, additional munitions debris and potential munitions and explosives of concern (MEC) were discovered and excavation work was halted for further site evaluation
  - At Army direction, excavation work has ceased and open areas will be backfilled and no intrusive activities will be performed at the site.
  - Remaining excavation work will need to be completed under a separate contract that includes munitions response support.
- Existing excavation areas will be backfilled as a safety measure
- Options for constructing the LHAAP-17 groundwater extraction system without requiring intrusive activities are currently being considered

# Restoration Advisory Board Meeting

## LHAAP-17 Remedial Action Update



## Documents in Process

| Site     | Document  |
|----------|---|
| LHAAP-46 | Annual RA(O) Report   |
| LHAAP-50 | Contingency RAWP  |
| LHAAP-58 | Annual RA(O) Report   |
| LHAAP-67 | Annual RA(O) Report   |
| GWTP     | Quarterly Evaluation Report: Second Quarter (April – June 2019)<br>Quarterly Evaluation Report: Third Quarter (July – September 2019) |

## 3 Month Look Ahead - Field Work by Bhate Team

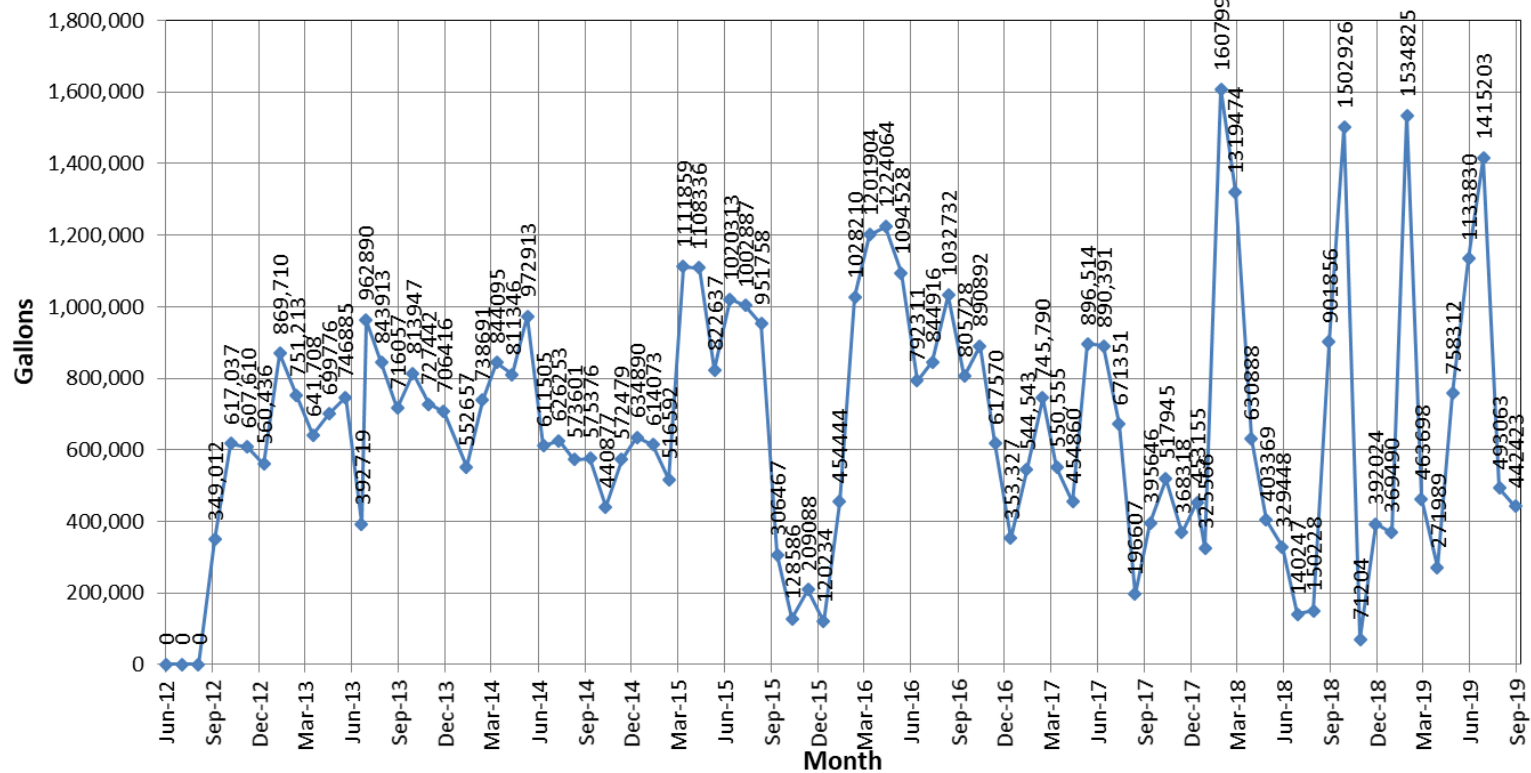
| Site        | Activity  |
|-------------|---|
| LHAAP-03    | Complete excavation backfill                                    |
| LHAAP-04    | Performance monitoring  |
| LHAAP-16    | Performance monitoring  |
| LHAAP-17    | Complete excavation backfill and extraction system installation |
| LHAAP-37    | RA(O) Sampling – November 2019                                  |
| LHAAP-50    | RA(O) Sampling – November 2019                                  |
| LHAAP-58    | RA(O) Sampling – December 2019                                  |
| LHAAP-67    | RA(O) Sampling – November 2019                                  |
| LHAAP-18/24 | RA(O) Sampling – December 2019                                  |

## 3 Month Look Ahead – Documents by Bhate Team

| Site                               | Document  |
|------------------------------------|---|
| LHAAP-50                           | Finalize the Contingency RAWP   |
| LHAAP-58                           | Finalize the Year 5 RA(O) Report  |
| GWTP, LHAAP-16,<br>and LHAAP-18/24 | Quarterly Evaluation Report: Second Quarter (April –June 2019)<br>Quarterly Evaluation Report: Third Quarter (July –September 2019) |

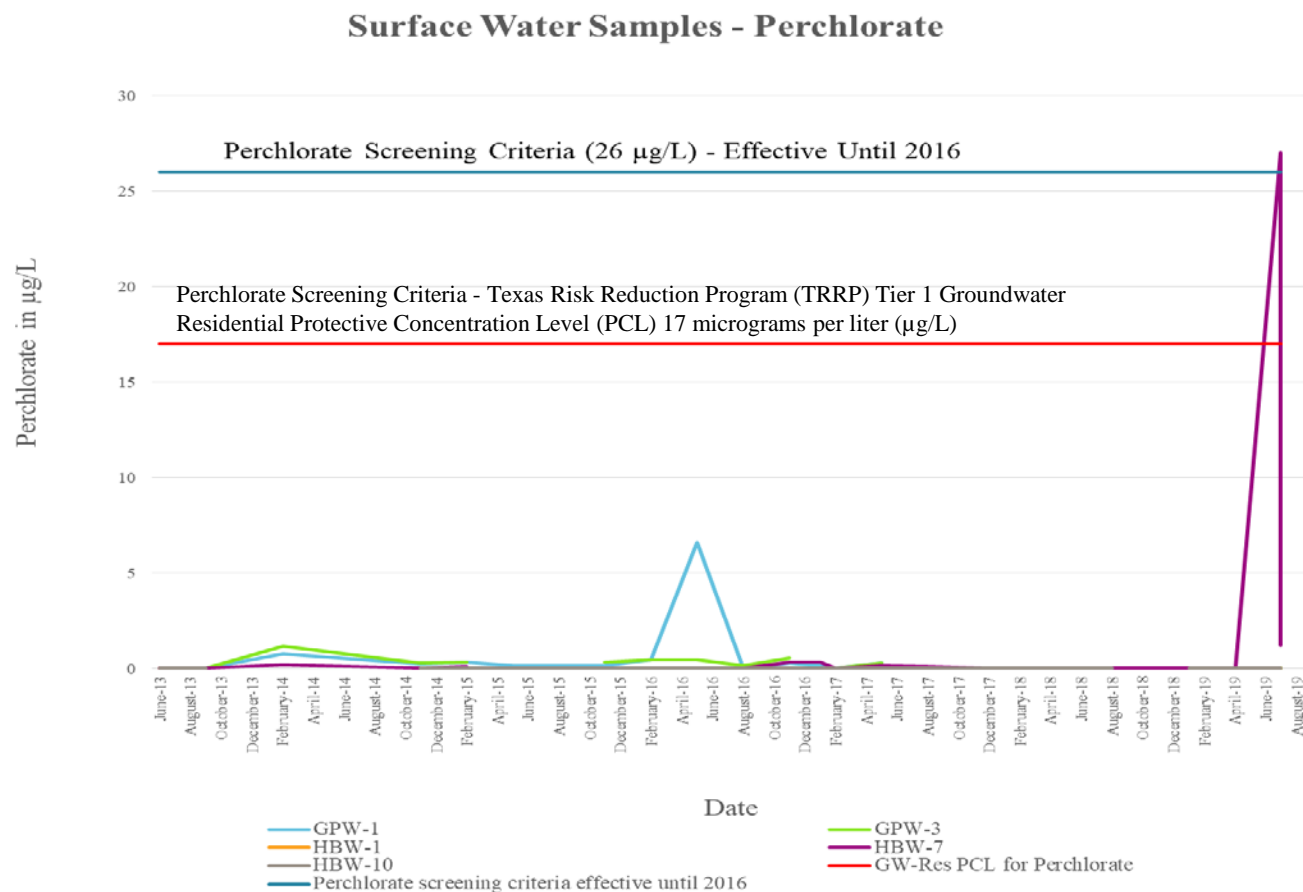
## GWTP Update

Treated Groundwater Discharged Monthly from June 2012 through September 2019



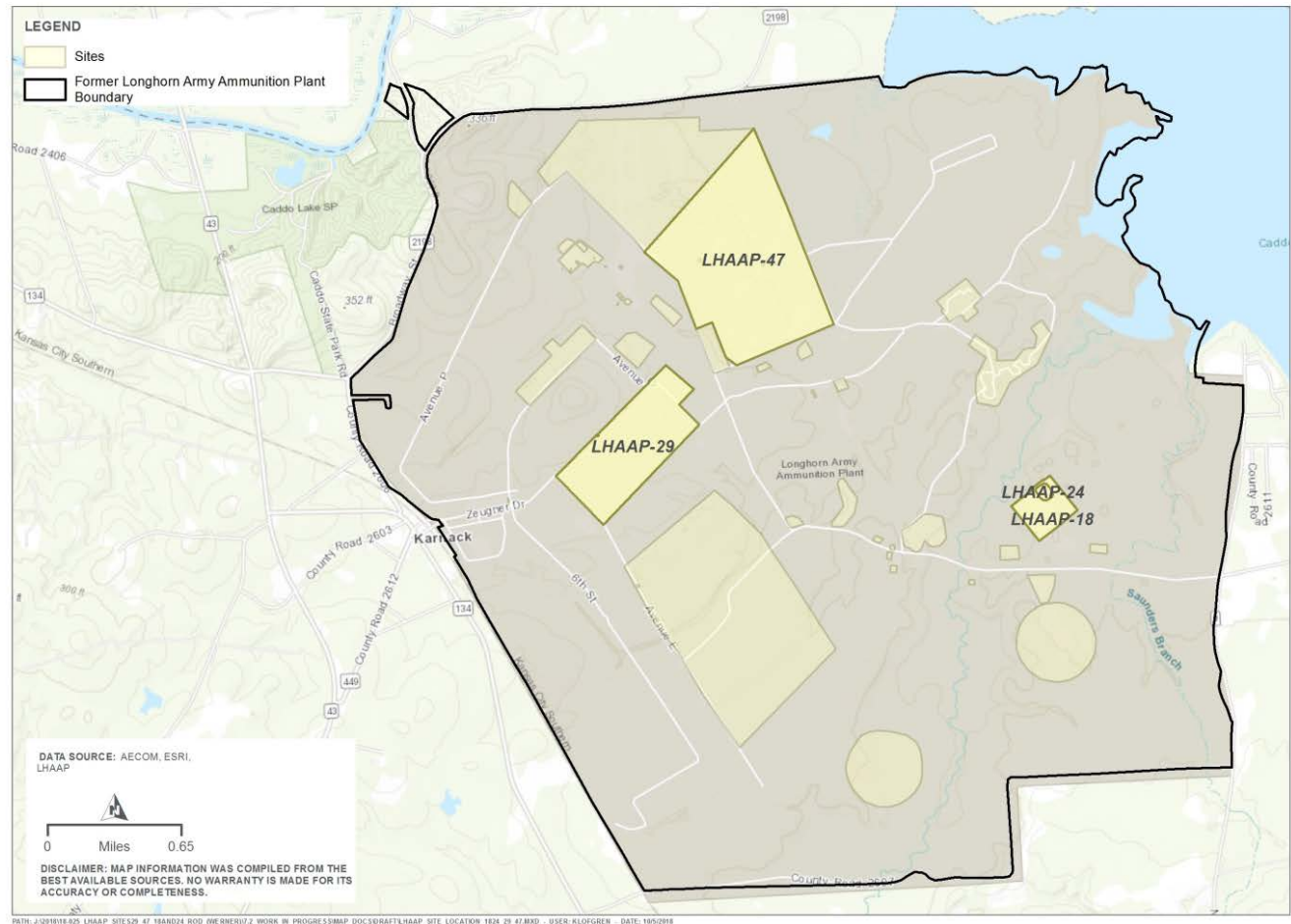
# Restoration Advisory Board Meeting

## Surface Water Sample Results



Note: Surface water at HBW-7 had a detection of 27  $\mu\text{g/L}$  from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2  $\mu\text{g/L}$ .

# LHAAP-18/24, 29, 47 Status Update



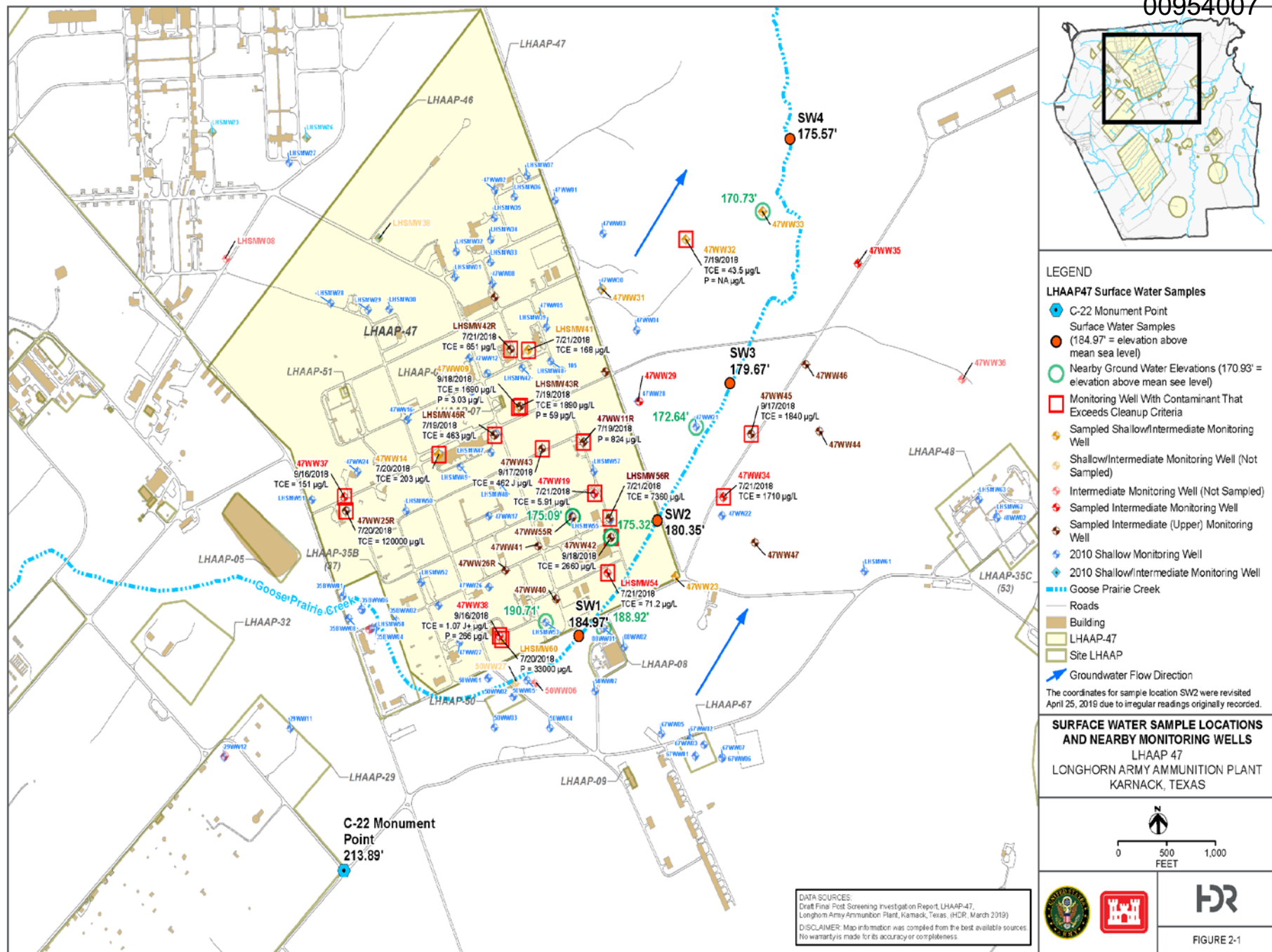


# LHAAP-18/24 & 29 Document Status

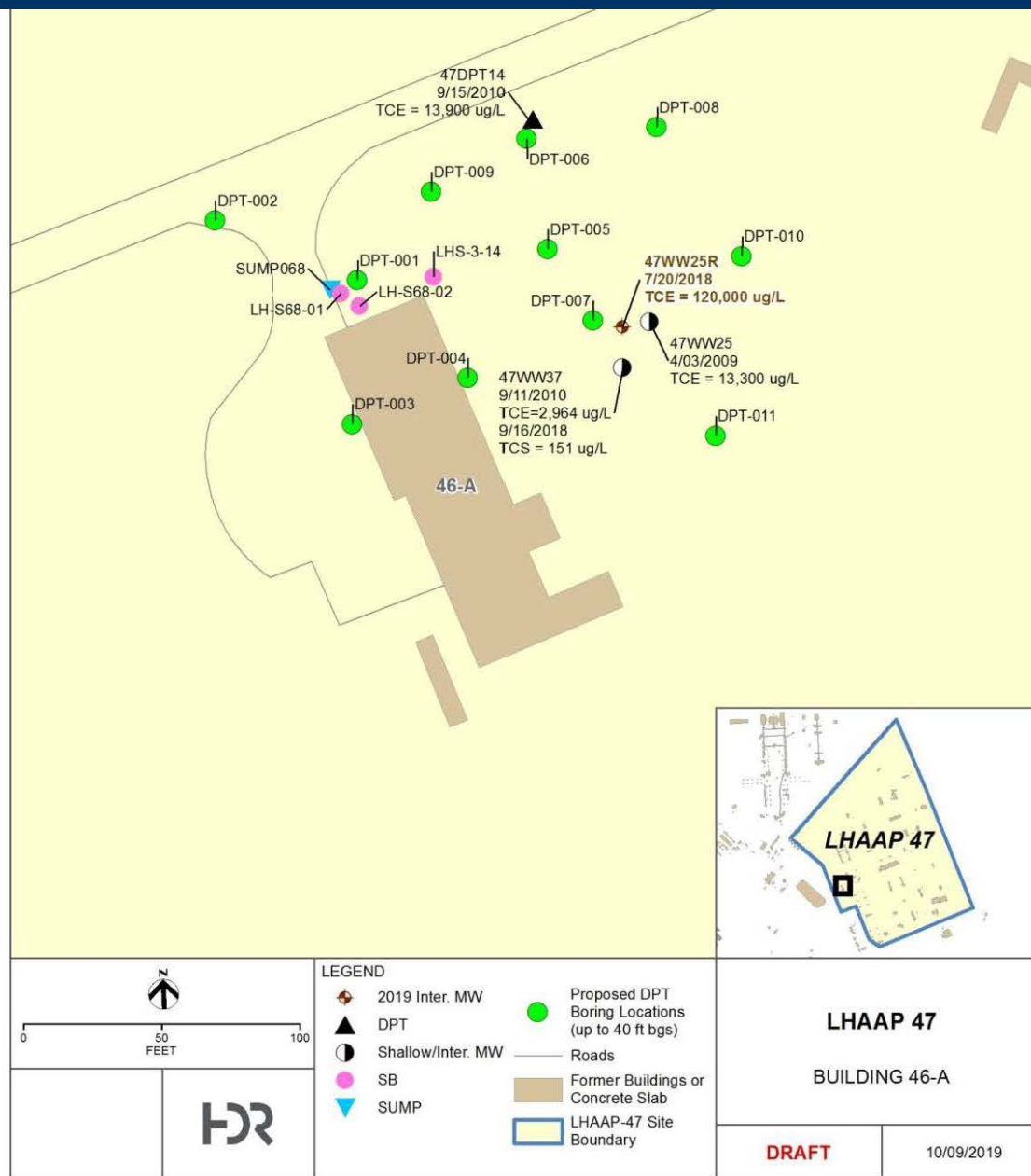
- **LHAAP-18/24**
  - **Draft Record of Decision submitted to the Regulators September 6, 2019**
- **LHAAP-29**
  - **Final Record of Decision signed September 19, 2019**
  - **Notice of Availability published in the Marshall News Messenger and Shreveport Times on October 13, 2019 and October 9, 2019 respectively. The ROD is available for public review at the Marshall Public Library.**
- **LHAAP-47**
  - **Draft PSI Work Plan Addendum No. 2 in Regulator review- Fieldwork to support the Record of Decision anticipated in early November 2019.**

## LHAAP-47 Field Work Plan

- **Work Planned**
  - **11 Direct Push Technology (DPT) borings**
  - **33 soil samples and 11 groundwater samples collected from DPT borings to identify source and extent**
  - **Collect groundwater samples from 3 existing wells for confirmation of results**



# LHAAP-47 Field Work Plan



## Next RAB Meeting Schedule & Closing Remarks

- Schedule January 2020 RAB Meeting
- Other Issues/Remarks
- Thank you for coming



## Groundwater Treatment Plant - Processed Groundwater Volumes

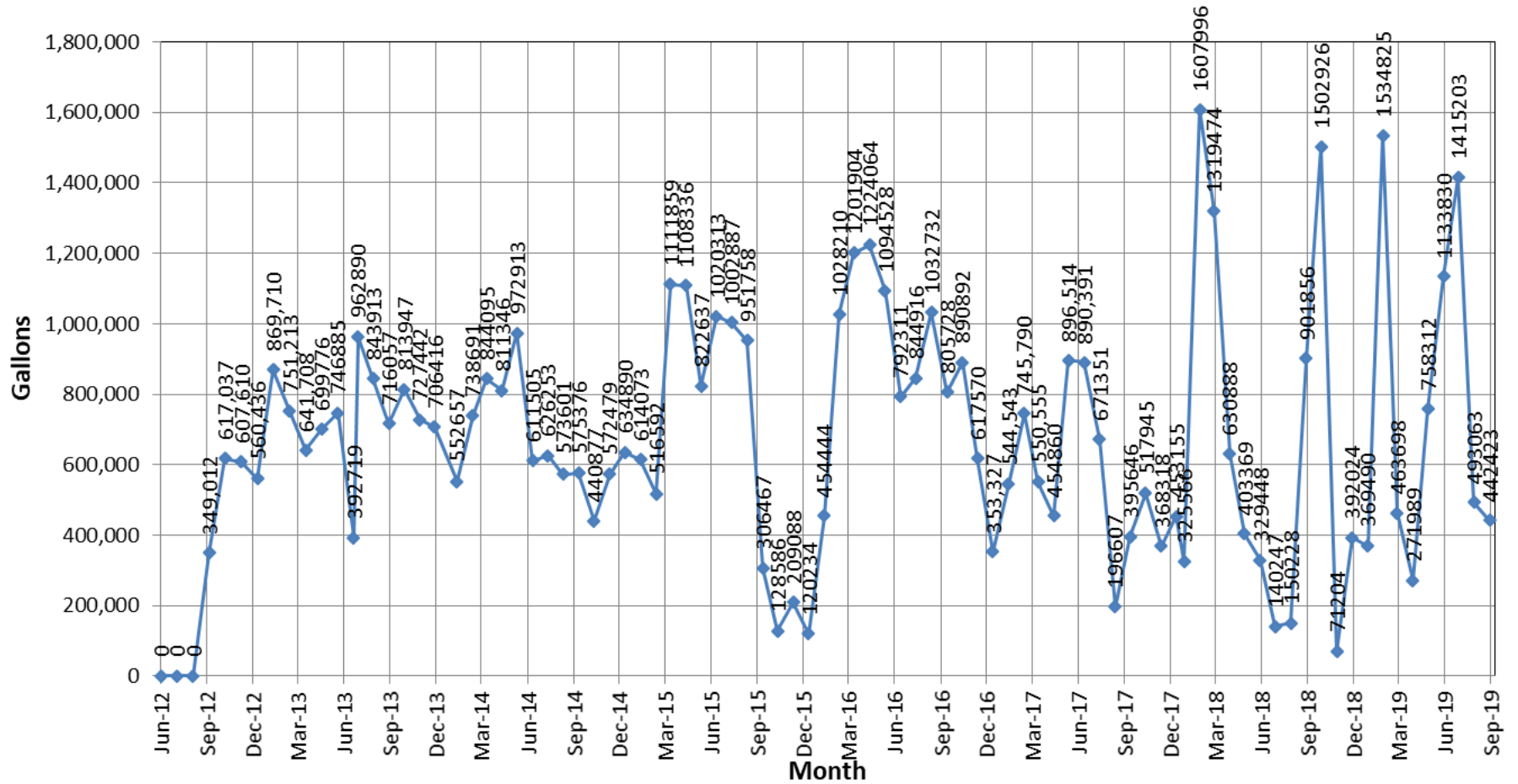
The amount of groundwater treated is determined by measuring the number of gallons of processed water discharged.

### Processed Water Discharged 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   | 843,913   | 716,057   |
| Oct-13    | Nov-13  | Dec-13  | Jan-14  | Feb-14    | Mar-14    | Apr-14    | May-14    | Jun-14    | Jul-14    | Aug-14    | Sep-14    |
| 813,974   | 727,442 | 706,416 | 552,657 | 738,691   | 844,095   | 811,346   | 972,913   | 611,505   | 626,253   | 573,601   | 575,376   |
| Oct-14    | Nov-14  | Dec-14  | Jan-15  | Feb-15    | Mar-15    | Apr-15    | May-15    | Jun-15    | Jul-15    | Aug-15    | Sep-15    |
| 440,877   | 572,479 | 634,890 | 614,073 | 516,592   | 1,111,859 | 1,108,336 | 822,637   | 1,020,313 | 1,002,887 | 951,758   | 306,467   |
| Oct-15    | Nov-15  | Dec-15  | Jan-16  | Feb-16    | Mar-16    | Apr-16    | May-16    | Jun-16    | Jul-16    | Aug-16    | Sep-16    |
| 128,586   | 209,088 | 120,234 | 454,444 | 1,028,210 | 1,201,904 | 1,224,064 | 1,094,528 | 792,311   | 844,916   | 1,032,732 | 805,728   |
| Oct-16    | Nov-16  | Dec-16  | Jan-17  | Feb-17    | Mar-17    | Apr-17    | May-17    | Jun-17    | Jul-17    | Aug-17    | Sep-17    |
| 890,892   | 617,570 | 353,327 | 544,543 | 745,790   | 550,555   | 454,860   | 896,514   | 890,391   | 528,538   | 195,198   | 961,324   |
| Oct-17    | Nov-17  | Dec-17  | Jan-18  | Feb-18    | Mar-18    | Apr-18    | May-18    | Jun-18    | Jul - 18  | Aug-18    | Sep-18    |
| 517,945   | 368,318 | 453,155 | 325,566 | 1,607,996 | 1,319,474 | 630,888   | 403,369   | 329,448   | 140,247   | 150,228   | 901,856   |
| Oct-18    | Nov-18  | Dec-18  | Jan-19  | Feb-19    | Mar-19    | Apr-19    | May-19    | June-19   | Jul - 19  | Aug-19    | Sep-19    |
| 1,502,926 | 71,204  | 392,024 | 369,490 | 1,534,825 | 463,698   | 271,989   | 758,312   | 1,133,830 | 1,415,203 | 493,063   | 442,423   |

\*Indicates Estimate

## Treated Groundwater Discharged Monthly from June 2012 through September 2019



### Water Discharge Location and Volume (Gallons)

| Month   | Total Combined to Harrison Bayou | LHAAP-18/24 Sprinklers | GWTP To INF Pond | INF Pond to Harrison Bayou | Contract Hauled Off-Site |
|---------|----------------------------------|------------------------|------------------|----------------------------|--------------------------|
| Dec-16  | 0                                | 236,688                | 0                | 0                          | 0                        |
| Jan-17  | 0                                | 0                      | 0                | 0                          | 0                        |
| Feb-17  | 0                                | 0                      | 0                | 0                          | 14,355                   |
| Mar-17  | 127,242                          | 0                      | 0                | 0                          | 14,400                   |
| Apr-17  | 113,038                          | 0                      | 236,821          | 0                          | 0                        |
| May-17  | 0                                | 0                      | 534,155          | 0                          | 0                        |
| Jun-17  | 958,404                          | 0                      | 294,550          | 490,574                    | 0                        |
| Jul-17  | 0                                | 0                      | 528,538          | 0                          | 0                        |
| Aug-17  | 0                                | 0                      | 195,197          | 0                          | 0                        |
| Sep-17  | 651,434                          | 0                      | 309,980          | 651,434                    | 0                        |
| Oct-17  | 0                                | 0                      | 517,945          | 0                          | 0                        |
| Nov-17  | 0                                | 0                      | 368,318          | 0                          | 0                        |
| Dec-17  | 560,350                          | 0                      | 453,155          | 560,350                    | 0                        |
| Jan-18  | 325,566                          | 0                      | 253,177          | 325,566                    | 0                        |
| Feb-18  | 1,607,996                        | 0                      | 62,017           | 1,430,634                  | 0                        |
| Mar-18  | 1,319,474                        | 0                      | 0                | 870,816                    | 0                        |
| Apr-18  | 630,888                          | 0                      | 0                | 630,888                    | 0                        |
| May-18  | 403,369                          | 0                      | 0                | 403,369                    | 0                        |
| Jun-18  | 193,669                          | 0                      | 135,779          | 0                          | 0                        |
| Jul -18 | 0                                | 0                      | 140,247          | 0                          | 0                        |
| Aug -18 | 49,409                           | 0                      | 100,819          | 0                          | 0                        |
| Sep-18  | 585,397                          | 0                      | 316,459          | 524,484                    | 0                        |
| Oct-18  | 1,409,106                        | 0                      | 93,820           | 1,016,285                  | 0                        |
| Nov-18  | 71,204                           | 0                      | 0                | 0                          | 0                        |
| Dec-18  | 392,024                          | 0                      | 0                | 0                          | 0                        |
| Jan-19  | 369,490                          | 0                      | 0                | 369,490                    | 0                        |
| Feb-19  | 1,534,825                        | 0                      | 0                | 1,326,485                  | 0                        |
| Mar-19  | 463,698                          | 0                      | 0                | 83,250                     | 0                        |
| Apr-19  | 271,989                          | 0                      | 0                | 0                          | 0                        |
| May-19  | 758,312                          | 0                      | 0                | 253,817                    | 0                        |



| <b>Month</b> | <b>Total Combined to<br/>Harrison Bayou</b> | <b>LHAAP-18/24<br/>Sprinklers</b> | <b>GWTP To INF<br/>Pond</b> | <b>INF Pond to<br/>Harrison Bayou</b> | <b>Contract<br/>Hauled<br/>Off-Site</b> |
|--------------|---|-----------------------------------|-----------------------------|---------------------------------------|---|
| Jun-19       | 1,133,830                                   | 0                                 | 0                           | 847,918                               | 0                                       |
| Jul -19      | 1,415,203                                   | 0                                 | 0                           | 903,001                               | 0                                       |
| Aug-19       | 374,629                                     | 0                                 | 118,434                     | 0                                     | 0                                       |
| Sep-19       | 0   | 0                                 | 442,423                     | 0                                     | 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 the sampling location is dry.

## Surface Water Sample Data (in micrograms per liter)

| Quarter         | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 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         | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 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         | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 3 <sup>rd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 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         | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 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             | NS              | 1.65            | 0.735           |
| GPW-3           | dry             | 0.199J          | 0.673           | dry             | dry             | 1.31            | 0.261           | dry             | NS              | 1.74            | 0.754           |
| HBW-1           | dry             | <0.1U           | <0.2U           | dry             | dry             | <0.1U           | 0.1U            | dry             | NS              | <0.2U           | <0.2U           |
| HBW-7           | dry             | <0.1U           | <0.2U           | dry             | dry             | 0.171J          | 0.1U            | dry             | NS              | <0.2U           | <0.2U           |
| HBW-10          | dry             | <0.1U           | <0.2U           | dry             | dry             | <0.1U           | 0.1U            | dry             | NS              | <0.2U           | <0.2U           |

| Quarter         | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Creek Sample ID | Jun 2013        | Sept 2013       | Dec 2013        | Feb 2014        | May 2014        | Aug 2014        | Nov 2014        | Feb 2015        | May 2015        | Aug 2015        | Nov 2015        |
| GPW-1           | dry             | <0.2 U          | dry             | 0.766           | dry             | dry             | 0.244 J         | 0.311 J         | 0.156J          | dry             | 0.142 J         |
| GPW-3           | dry             | <0.2 U          | dry             | 1.15            | dry             | dry             | 0.276 J         | 0.344 J         | dry             | dry             | 0.311 J         |
| HBW-1           | <0.2U           | <0.2 U          | dry             | <0.2 U          | dry             | dry             | <0.2 U          | <0.2 U          | dry             | dry             | <0.2 U          |
| HBW-7           | <0.2U           | <0.2 U          | dry             | 0.201 J         | dry             | dry             | <0.2 U          | 0.124 J         | dry             | dry             | <0.2 U          |
| HBW-10          | <0.2U           | <0.2 U          | dry             | <0.2 U          | dry             | dry             | <0.2 U          | <0.2 U          | dry             | dry             | <0.2 U          |

| Quarter         | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Creek Sample ID | Feb 2016        | May 2016        | Aug 2016        | Nov 2016        | Feb 2017        | May 2017        | Aug 2017        | Dec 2017        | Mar 2018        | June 2018       | August 2018     |
| GPW-1           | 0.447           | 6.59            | <0.2 U          | 0.301 J         | <1 U            | 0.263           | dry             | <4.0 U          | <4.0 U          | dry             | <2.0 U          |
| GPW-3           | 0.474           | 0.457           | 0.141           | 0.563           | <1 U            | 0.274           | dry             | <4.0 U          | <4.0 U          | dry             | <2.0 U          |
| HBW-1           | <0.2 U          | <0.2 U          | <0.2 U          | <0.2 U          | <1 U            | <0.2 U          | <0.2 U          | 1.1 J           | <4.0 U          | dry             | <2.0 U          |
| HBW-7           | <0.2 U          | <0.2 U          | <0.2 U          | 0.318 J         | <1 U            | 0.155           | <0.2 U          | <4.0 U          | <4.0 U          | dry             | <2.0 U          |
| HBW-10          | <0.2 U          | <0.2 U          | <0.2 U          | <0.2 U          | <1 U            | <0.2 U          | 0.111J          | <4.0 U          | <4.0 U          | dry             | <2.0 U          |

NS – not sampled

U – non-detect

J – Estimated

Dry – no surface water

| Quarter               | 4th         | 1st         | 2nd           | 3rd                                      |
|-----------------------|-------------|-------------|---------------|--|
| Creek<br>Sample<br>ID | Oct<br>2018 | Jan<br>2019 | April<br>2019 | July 2019                                |
| GPW-1                 | <2.0 U      | <2.0 U      | <2.0 U        | <2.0 U                                   |
| GPW-3                 | <2.0 U      | <2.0 U      | <2.0 U        | <2.0 U                                   |
| HBW-1                 | <2.0 U      | <2.0 U      | <2.0 U        | <2.0 U                                   |
|                       | <2.0 U      | <2.0 U      | <2.0 U        | 27<br>(initial)/<br>1.2 J<br>(re-sample) |
| HBW-7                 |             |             |               |  |
| HBW-10                | <2.0 U      | <2.0 U      | <2.0 U        | <2.0 U                                   |

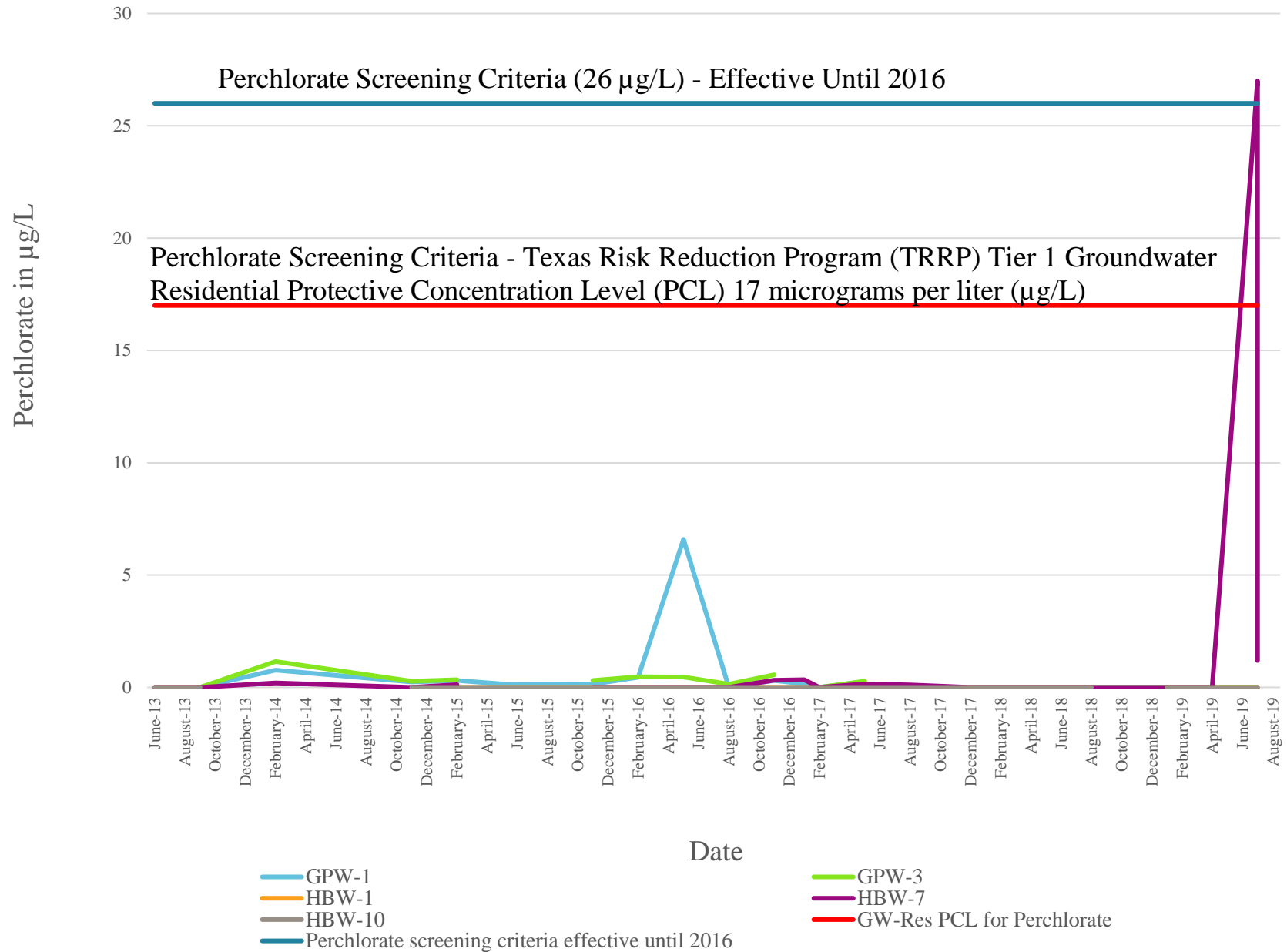
NS – not sampled

U – non-detect

J – Estimated

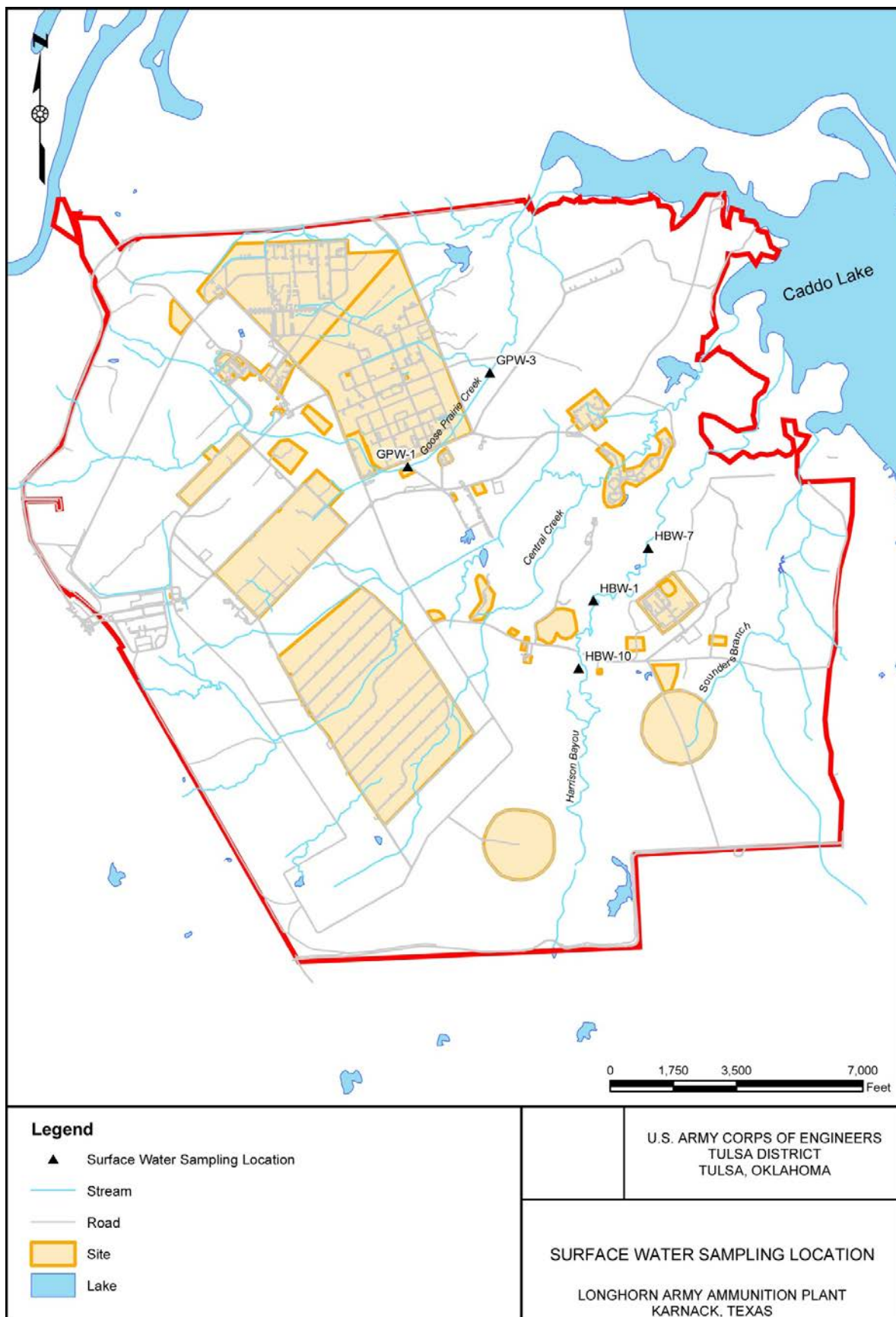
Dry – no surface water

## Surface Water Samples - Perchlorate



Note: Surface water at HBW-7 had a detection of 27  $\mu\text{g/L}$  from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2  $\mu\text{g/L}$ .

### Longhorn Army Ammunition Plant Creek Sampling Locations



**Subject:** Draft Minutes, Monthly Managers' Meeting (MMM),  
Longhorn Army Ammunition Plant (LHAAP)  
**Location of Meeting:** LHAAP Site Trailer and via Teleconference  
**Date of Meeting:** 16 January 2020– 10:30 Central Standard Time (CST)

#### **Attendees:**

Army BRAC: Rose M. Zeiler (RMZ)  
USEPA: Bill Rhotenberry (BR) and Kent Becher (KB)-USGS Liaison  
AEC: Andrew Maly (AM)  
TCEQ: April Palmie (AP)  
USACE: Aaron Williams (AW), Scottie Fiehler (SF) and Chris Graber (CG)  
Bhate: Kim Nemmers (KN), Scott Beesinger (SB) and Sally Smith (SS)  
APTIM: Bill Foss (BF) and Praveen Srivastav (PS) - on phone  
USFWS: Paul Bruckwicki (PB)

#### **Action Items**

**Bhate/APTIM:** SS took a moment to present SB with the 2019 Safety Award for Bhate. SS noted that this award is for going above and beyond in ensuring safety and leadership at LHAAP this past year.

#### **Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update**

**Groundwater Treatment Plant (GWTP) -** Storm damage to the area was discussed. SB said that three huge oak trees went down by the bayou and caught the power pole. The other two breaks were easy to fix and there was one cross arm to replace. SB said that the GWTP was down from 12:30 am Saturday through Wednesday morning. SB said that debris in the bayou by the outfall from the GWTP is causing a blockage. PB said that they have been clearing roads. PB said that John Stephens will work with SB on the issue. SB said that the reduced flow from the storm debris can cause an effect on the ability to discharge. SB said that there are two locations for sure and that it can be removed with a trackhoe.

KN explained that the air stripper blower had to be replaced. Since the replacement, KN explained that the air stripper was not treating trichloroethylene (TCE) and methylene chloride down to the maximum contaminant levels (MCLs). KN said that the blower was not pushing as much air as it started to fail and that the air stripper is not known to have been serviced in over 20 years of operation. KN pointed out that the air stripper was still very efficient after all this time. KN said that flow of air was reduced to improve the efficiency to allow for a longer contact time by the water on the media. KN said that the media was removed to evaluate the build-up. SB explained that the manway on the air stripper had to be removed and that the bolts had to be cutoff due to rusting. Visually, SB said that much of the media appear clean. SB said he had run some tests to evaluate an acid solution and he has come up with a solution that will work. SB said the next step is to determine how to pass the acid mixture through the media. KN explained that after the air stripper that there are two Granular Activated Carbon (GAC) vessels are off line. SB explained that the glass line for the one GAC vessel can't be fixed and so that one went offline around five years ago. SB said that the other GAC vessel was taken off line due to clogging and reducing overall GWTP flow. SB said that the GAC vessels were originally in place due to the amber coloring of the water from LHAAP-16. SB explained that there are no manways on top of the GAC vessels. KN said that they are awaiting information from a vendor but understand that these GAC vessels likely need to be removed and replaced.

SB explained that the GWTP damage from the storm was only to the discharge line from the acid tank. BLOC will be onsite tomorrow (1/17/2020) to make repairs to the conduit line. RMZ asked if the storm could have popped the valve on the acid tank to which SB said no. RMZ asked about the backup tank for the acid tank. SB said that the 10,000 gallon dilute acid vessel is onsite, next to the air stripper, and just needs to hook up to the tank. RMZ asked about what happens in the event of an acid release. SB stated that the acid would go into the sump and then a gas powered pump would be used to pump it into the onsite tank. RMZ confirmed that the sump is no longer automatic which SB confirmed. AP asked if this manual operation was due to the previous acid release which SB confirmed. KN also noted that less acid is being ordered and that frequency of ordering will increase.

KB asked about the water conveyance line breaks at LHAAP-18/24. SB said that the line to 18WW117 was replaced in October 2019.

**LHAAP-03** – BF said that the excavations at LHAAP-03 are still full of water. BF said that some tarping pulled back a bit and that we would fix in the afternoon. AP asked if the soil was clean. BF explained that the soil was awaiting disposal following additional excavation of the remaining sidewall.

**LHAAP-16**- BF stated that the LHAAP-16 injections were completed before Christmas. BF said that the first round of design effectiveness monitoring has been completed with exception of biobarrier 2. AP asked if the sampling includes the new wells. BF said that this is just the initial monitoring following the injections, so it does not include the newly installed monitoring wells. RMZ asked if the groundwater is being analyzed for volatile organic compounds (VOC). BF clarified that the design effectiveness sampling includes bromide and total organic carbon analysis to evaluate the distribution. BF discussed the need for a second round of design effectiveness monitoring will be determined based upon the first round results. BF said that the first round of quarterly performance monitoring will be performed in March 2020 (three months after the injections were completed). RMZ said that the Remedial Action Completion Report (RACR) is due in May per the DI tracker. AP clarified that RACR will only have the design effectiveness sampling results.

**LHAAP-17** – BF said that Area H is filling up with rainwater in the excavated area of LHAAP-17. AP asked if APTIM was looking to discharge to the GWTP. BF said that the current evaluation was for discharge to the bayou. BF said that the question is how much flow should be used in the calculation considering the dilution. BF said some backfill is present to potentially berm up an area. AP suggested using sand bags. BF said the covers over the stockpile areas were also pulled back a bit by the storm and will be addressed with additional sheeting. RMZ said that she will be discussing the enforceable schedule with the regulators in a separate meeting. BF asked if there was anything more formal needed for documenting the soil removal. BF said that a RACR was previously planned to include the groundwater extraction system. AW said that the next contract will include the RACR for the soils and groundwater. SF said that documentation of some sort is helpful. BF said that a summary report for the excavation has already been submitted to the Army, but didn't include the backfilling. AP said that certain areas are done and could get regulator concurrence if backfilled. AP said that a discharge process is necessary for areas that are still contaminated. AW said that only the clean areas will need to be backfilled under the current contract.

RMZ said that we need an avenue for Regulatory approval of areas that do not require further excavation. AP said that an excavation report might be appropriate. AP said that a report prepared for LHAAP-17 to present excavation activities to date should not be called a removal report. BF said that data previously provided includes pre- and post-excavation sample information. RMZ said that the RACR will include both sets of excavation activities in one report. KN suggested the document describing the munitions and explosives of concern (MEC) response and additional excavation plans

be called a Remedial Design (RD) Amendment for the additional soil removal efforts. AP clarified that the remedy will still be implemented aside from the MEC. RMZ stated that a new RD may be required and suggested this be an amended RD. RMZ agreed that an amended RD would be done under the new contract but that the groundwater RD should remain the same. KN asked if the extraction system could be installed by Bhate after the area is cleared and excavated. SF said the issue is that there would not be enough time to implement the 18 month operation of the groundwater remedy under the contract Bhate currently holds.

**LHAAP-50** - BF said that the LHAAP-50 Underground Injection Control (UIC) package is being put together and will be submitted to TCEQ. BF said that APTIM is looking to complete the injections in late February or early March. KN asked how long the field work would take. BF said that it will be about two weeks based upon 12 points requiring injections.

KN asked everyone to refer to the Document and Issues Tracking Table dated January 16, 2020.

- **Task 1** (Project Management) – KN stated the Restoration Advisory Board (RAB) meeting was being held in the evening. RMZ said that Carol Fortune had resigned from the RAB. RMZ said that Mr. Pratt was attending that evening and that she would encourage attendees to consider joining the RAB, especially with a member resigning. KN thanked everyone for reviewing and finalizing the December 2019 MMM minutes after the holidays.
- **Task 3** (LHAAP-03) – BF stated that no documents were in progress as APTIM was awaiting the removal of the final soil contamination and the side wall sample.
- **Task 4** (LHAAP-04) – BF stated that the RACR is within internal APTIM review and should be to the Army in early February and the Regulators in March 2020. BF said that groundwater data collected after the injections to evaluate distribution was included with the January 2020 MMM information.
- **Task 5** (LHAAP-12) – BF stated that the annual groundwater sampling results from December 2019 would be provided at the February 2020 MMM.
- **Task 6** (LHAAP-16) – BF explained that the validated data from the first quarterly performance monitoring event will be provided in May 2020 because the sampling will not occur until March 2020.
- **Task 7** (LHAAP-17) – AW said that an executive decision had been made to eliminate groundwater extraction from Bhate's contract. AW explained the status of LHAAP-17 further since BR had not been involved during the remedial implementation. AW said that during the excavation munition items were found that were not expected based on the history of the site. AW said that the first few items discovered on August 30, 2019 and on September 7, 2019 were determined not to be live so the work continued. Near the end of the excavation the Army sent out an Ordnance and Explosives Safety Specialist (OESS), Hank Domme, who came out to watch the excavation and put MD items he found aside. On September 27, 2019, Mr. Domme found two, 81millimeter items that he could not determine to be empty. When the Explosive Ordnance Disposal (EOD) person came onsite, he determined the items were live and work was stopped. AW continued to explain that over 5,000 cubic yards of soil had been transported to East Texas Regional Landfill in Henderson, Texas that could have MEC in the soil. AM, AW, SF and CG met with Waste Connections, who manages the landfill. RMZ pointed out that there was notice provided to the landfill by the USACE that there could be live munitions items in the soil and they were asked to keep the soil segregated. AW said that he was then later told that the soil was buried. AW said that about 1,000 cubic yards was used for roadway base. About 2,000 cubic yards was used as landfill cover in 4 to 6-inch layers. AW said that less than 1,000 cubic yards was in a stockpile. CB, who is an OESS, walked the site and didn't observe



anything munitions-related. As to path forward, AW said that a couple of OESS personnel could walk the site with magnetometers. AW said that the work is currently planned to be completed by internal folks in about a month. BR said that the path forward made sense. AM said that the landfill operator is going to mark out where the soil has been spread so that they can take avoidance steps when they drill the gas vents. AM is to discuss the issue with the Army's legal due to the liability. AM said that longer term plan will be developed to ensure that the landfill remains a landfill for perpetuity but that plan may take a while to develop. AP and BR said they would like to be kept updated as work at the landfill, associated with LHAAP-17, progresses.

- **Task 9** (LHAAP-37) – BF stated that the Year 3 1<sup>st</sup> semiannual sampling results would be provided at the February 2020 MMM. PS stated that the Year 2 Annual RA(O) Report was submitted to the Army today for review.
- **Task 10** (LHAAP-46) –BF stated that Year 5 Annual RA-O data report is in internal APTIM review. RMZ asked about the new wells being installed. BF stated that the replacement well for the obstructed well had been installed and sampled and that a recommendation for a new well to the north was being included in the report.
- **Task 11** (LHAAP-50) –BF stated that the Year 5 RA-O Report is in internal review. BF stated that the RD/RAWP needs to be placed into the AR as it was approved by the EPA and TCEQ.
- **Task 12** (LHAAP-58) – KN stated that groundwater sampling of the eastern and western plumes had been completed in December 2019 and that the sampling results would be included in the February 2020 MMM. KN stated that the next sampling event is planned for March 2020 and will include only the western plume.
- **Task 13** (LHAAP-67) – BF explained that the Army comments on the Year 5 Annual RA-O Report had been received and that the draft should be out to the Regulators in February 2020 following resolution of those comments.
- **Task 14** (LHAAP-001-R and -003-R) - KN stated that LUC inspections would be completed early this year due to the storm that recently occurred.
- **Task 16** (GWTP) – KN indicated that the 3<sup>rd</sup> Quarter 2019 GWTP Report was issued to the Regulators for review. KN stated that the 4<sup>th</sup> Quarter 2019 GWTP Report was not being prepared yet as Bhate was awaiting validated data from December 2019.
- **Task 17** (LHAAP-18/24) – KN stated that the validated data from the LHAAP-18/24 sampling completed in December 2019 would be provided at the February 2020 MMM. KN also stated that the 4<sup>th</sup> Quarter 2019 GWTP Report would include this data.
- **Task 18** (Surface Water) – SB stated that he planned to collect the surface water samples the following week.
- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was completed and would be placed into the AR
- **Administrative Record (AR)** –RMZ said that the Restoration Advisory Board (RAB) members need to be provided documents quickly if they are available in hard copy or compact disc (CD) if they request it. RMZ said that the RAB does not need to wait for the AR to review a specific document. BF suggested putting a link to the major documents on the website. AP said that Laura-Ashley should be able to get the documents since she has an EPA TAG grant. George Rice does technical document review for Caddo Lake. AP said that it is helpful to have those major documents up on the website in addition to the AR. AP pointed out that the LHAAP-16 data from across the creek trichloroethylene (TCE) has not been reported formally. BF noted that the data would be included in the RACR for

LHAAP-16. RMZ said that the data should be presented to the public in the context of the entire remedy implementation and not piecemeal. All were in agreement.

#### **Update on other DERP Sites:**

- **LHAAP 18/24** –AW stated that the Army signed the Record of Decision (ROD) for LHAAP-18/24 and that the final ROD was submitted to EPA and TCEQ. AP said that she had not received a hard copy yet but had routed the ROD around for approvals. BR said that the ROD was in routing at the EPA also.
- **LHAAP-29** – AW said that there were no updates on LHAAP-29.
- **LHAAP-47** – RMZ stated that dates provided in the Enforceable Schedule would be missed. RMZ said that she needs to look at the Federal Facility Agreement for the criteria used to defer the enforceable schedule. RMZ stated that LHAAP-47 impacts were worse than what was expected based on the most recent data collected. AW explained that HDR, Inc.'s contract was being modified to allow for additional investigation based upon the Post-Screening Investigation (PSI) number 2. AW stated that the Interim Draft PSI was being reviewed as it was submitted on December 26, 2019. RMZ asked KB if he had reviewed the report because she wanted to discuss with them the scope of the additional investigation. KB said that he had reviewed and provided comments to BR.
- **Well Abandonment** – RMZ stated that there are a large number of wells that should be abandoned. AW stated that he is working on the list of wells and that this effort was already funded. KN stated that being able to abandon the wells in late February or early March would be ideal when we mobilize to complete LHAAP-50. AP asked about the data set being used. AW stated that he was using a historical consolidation of all the wells that had been installed. KB stated that he has an inventory list that he completed previously. RMZ asked KB to provide the list to which KB concurred.

**USFWS** – KN asked about buildings being demolished by the USFWS. SB said he was told that the phone building is coming out. PB said that the 703 D and E Records and computer building are coming down. PB said that the phone building may come down at some point and is being discussed. PB said that he currently doesn't have a phone in his office due to the current phone system being so antiquated. PB confirmed that the phone lines could be affected at some time in the future however.

PB said that USFWS would coordinate with SB on the tree removal. PB said that these trees are twisted off. PB believes that the tornado may have not touched down but bounced as it passed over the refuge. BF said that it was reported that there were short-lived "spin-up" type tornadoes occurring within the larger line of storms that moved through.

#### **Schedule Next Managers' Meeting**

The next MMM will be held on Wednesday, February 19, 2020 at 1:00 pm CST via conference call.

Meeting concluded at approximately 12:00 pm CST.

#### **ACRONYM LIST**

|       |                                      |
|-------|--------------------------------------|
| AEC   | Army Environmental Command           |
| AP    | April Palmie                         |
| APTIM | APTIM Federal Services, LLC          |
| AR    | Administrative Record                |
| AW    | Aaron Williams                       |
| BF    | Bill Foss                            |
| Bhate | Bhate Environmental Associates, Inc. |

|       |   |
|-------|---|
| BR    | Bill Rhotenberry                              |
| BRAC  | Base Realignment and Closure                  |
| CD    | Compact Disc                                  |
| CG    | Chris Graber                                  |
| CST   | Central Standard Time                         |
| DERP  | Defense Environmental Restoration Program     |
| EOD   | Explosive Ordnance Disposal                   |
| GAC   | Granular Activated Carbon                     |
| GWTP  | Groundwater Treatment Plant                   |
| KB    | Kent Becher                                   |
| KN    | Kim Nemmers                                   |
| LHAAP | Longhorn Army Ammunition Plant                |
| MCL   | Maximum Contaminant Level                     |
| MMM   | Monthly Managers' Meeting                     |
| MNA   | Monitored natural attenuation                 |
| PB    | Paul Bruckwicki                               |
| PBR   | Performance-Based Remediation                 |
| PP    | Proposed Plan                                 |
| PPM   | Parts per million                             |
| PS    | Praveen Srivastav                             |
| PSI   | Post-Screening Investigation                  |
| RAB   | Restoration Advisory Board                    |
| RACR  | Remedial Action Completion Report             |
| RA(O) | Remedial Action – Operation                   |
| RAWP  | Remedial Action Work Plan                     |
| RD    | Remedial Design                               |
| RMZ   | Rose M. Zeiler                                |
| ROD   | Record of Decision                            |
| SB    | Scott Beesinger                               |
| SF    | Scottie Fiehler                               |
| SS    | Sally Smith                                   |
| TCE   | Trichloroethylene                             |
| TCEQ  | Texas Commission on Environmental Quality     |
| USACE | United States Army Corps of Engineers         |
| USEPA | United States Environmental Protection Agency |
| VOC   | Volatile organic compound                     |

## **LHAAP Validated Data Packages for January 2020 Monthly Manager's Meeting**

| <b>LHAAP Area</b> | <b>Analytic Method</b>  |
|-------------------|---|
| <b>LHAAP-04</b>   | <i>November 2019 Post-Injection Sampling</i><br><i>Total Organic Carbon (SM5310C)</i> |

**LHAAP-04 Post Injection Performance Monitoring  
November 2019**

| Location Code         |       |     | 04WW05                              |          | 04WW07                              |          | 04WW09                              |          | 04WW10                              |          |
|-----------------------|-------|-----|-------------------------------------|----------|-------------------------------------|----------|-------------------------------------|----------|-------------------------------------|----------|
| Sample ID             |       |     | 04WW05-191113-Post-inj              |          | 04WW07-191113-Post-inj              |          | 04WW09-191113-Post-inj              |          | 04WW10-191113-Post-inj              |          |
| Sample Date           |       |     | 11/13/2019                          |          | 11/13/2019                          |          | 11/13/2019                          |          | 11/13/2019                          |          |
| Location Description: |       |     | Shallow Zone, Within Treatment Area |          | Shallow Zone, Within Treatment Area |          | Shallow Zone, Within Treatment Area |          | Shallow Zone, Within Treatment Area |          |
| Parameter             | Units | MCL | Result                              | Val Qual | Result                              | Val Qual | Result                              | Val Qual | Result                              | Val Qual |
| Total Organic Carbon  | mg/L  | NV  | 32.8                                |          | 35.3                                |          | 680                                 |          | 65                                  |          |

Notes:

MCL - Maximum Contaminant Limit

NV - No value established

mg/L - milligrams per liter

ID - Identification

Val Qual - validation qualifier



**DEPARTMENT OF THE ARMY**  
**LONGHORN ARMY AMMUNITION PLANT**  
**POST OFFICE BOX 220**  
**RATCLIFF, AR 72951**

February 5, 2020

DAIM-ODB-LO

Ms. April Palmie  
 Texas Commission on Environmental Quality  
 Superfund Section, MC-136  
 12100 Park 35 Circle, Bldg D  
 Austin, TX 78753

Re: February 2020 Underground Injection Control Substantive Requirements Notification for  
 Contingency Remedy at LHAAP-50, Longhorn Army Ammunition Plant, Karnack,  
 Texas

Dear Ms. Palmie,

The above-referenced document is being transmitted to you for your records. We are presumptively complying with the substantive requirements of 30 Texas Administrative Code (TAC) §331, Subchapters A, C, and H for Class V Injection Wells. Therefore, unless we hear in the negative within 30 calendar days (Mar 6, 2020), the injections will be implemented at Site LHAAP-50 mid to late March 2020.

The document was prepared by Bhate Environmental Associates, Inc., on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

Rose M. Zeiler, Ph.D.  
 Longhorn AAP Site Manager

Copies furnished:

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 K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD))  
 P. Srivastav, APTIM, Houston, TX (1 hard copy and 1 CD)



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**MEMORANDUM FOR RECORD**

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**DATE:** February 5, 2020

**PROJECT NAME:** Contingency Remedy for LHAAP-50, Longhorn Army Ammunition Plant, Karnack, Texas

**TO:** Rose Zeiler Site Manager  
Rick Smith Project Manager  
Aaron Williams Project Engineer

**FROM:** Kimberly Nemmers Bhate Project Manager, Cell No. 303-550-9239

**SUBJECT:** **LHAAP-50 Contingency Remedy Underground Injection Control Substantive Requirements Notification, Longhorn Army Ammunition Plant, Karnack, TX (Contract No. W9128F-13-D-0012, Task Order No. W912BV17F0150)**

**INTRODUCTION**

Remedial activities are required under the Explanation of Significant Differences, Record of Decision (ROD) for Contingency Remedy issued for the LHAAP-50 Former Sump Water Tank (U.S. Army 2019). The 3<sup>rd</sup> Annual Remedial Action Operation Report for LHAAP-50 indicated evidence of plume migration, increasing concentrations of perchlorate and trichloroethene (TCE) and geochemical conditions that are not optimal for monitored natural attenuation (MNA) and recommended that an in situ bioremediation (ISB) contingency remedy be implemented to enhance MNA. The Remedial Design/Remedial Action Work Plan (RD/RAWP) for the contingency remedy was submitted to Texas Commission on Environmental Quality (TCEQ) for review in October 2019 (U.S. Army 2019) and the Draft Final document was approved by TCEQ in January 2020.

As part of the selected remedy, in situ bioremediation (ISB) will be conducted in the most contaminated portion of the upper shallow and lower shallow groundwater zones. The ISB remedy includes 1) the installation of bio-injection grid in the vicinity of 50WW14 in the upper and lower shallow zones; 2) the installation of bio-injection grid in the vicinity of 50WW12 in the upper shallow zone (**Enclosure 1**, Attachment B).

ISB is planned to be conducted at LHAAP-50 in March 2020. The enclosed Class V Injection Well Inventory Form (**Enclosure 1**) and TCEQ Core Data Form (**Enclosure 2**) comply with the substantive requirements for construction, operation, and closure under 30 Texas Administrative Code (TAC) §331, Subchapters, A, C, and H (the Applicable or Relevant and Appropriate Requirements [ARARs] for underground injection control).

**SITE HISTORY**

LHAAP-50 (former sump water tank) is in the north-central portion of LHAAP and covers an area of approximately 1 acre (Class V Injection Well Inventory Form, **Enclosure 1**, Attachment A, Topographic Quadrangle Map). When operational, LHAAP-50 contained a 47,000-gallon capacity aboveground storage tank (AST) which received industrial wastewater from various industrial waste production sumps

throughout LHAAP between 1955 and 1988. After the solids were filtered, the storage tank contents were discharged into Goose Prairie Creek. The AST is no longer present.

The U.S. Army issued the Final ROD for LHAAP-50 in September 2010 that was signed by the Army on 23 September 2010 and co-signed by the USEPA on 30 September 2010. TCEQ concurred with the ROD on 4 October 2010. The remedy selected in the ROD included soil removal, MNA and land use controls (LUCs). The ROD stated that a contingency remedy to enhance MNA would be implemented to reach the RAOs if MNA was found to be ineffective and would be documented in the Explanation of Significant Difference (ESD). The COCs identified in the LHAAP-50 ROD included perchlorate and VOCs including tetrachloroethene (PCE), TCE, 1,1-dichloroethene (DCE), 1,2-dichloroethane (DCA), cis-1,2-dichloroethene (DCE) and vinyl chloride in groundwater and perchlorate in soil. Approximately 183 cubic yards of perchlorate contaminated soil was removed and disposed offsite in September 2013 as described in the Final Remedial Action Completion Report (AECOM 2016).

The 3<sup>rd</sup> Annual RAO Report (APTIM 2018) indicated that MNA was found to be ineffective. The TCE plume had expanded beyond its baseline footprint with increasing concentration trends at monitoring well 50WW12. TCE and Perchlorate plumes from the 4<sup>th</sup> Annual RAO events conducted in November 2017 and May 2018 are included **Enclosure 1**, Attachment E, Figure 1-5. Therefore, an ESD to the ROD (U.S. Army 2019) was prepared to document the significant change from the ROD selected remedy of MNA to implement the contingency remedy and proposed implementation of ISB to enhance MNA. The ISB contingency remedy is consistent with the ROD requirement to enhance MNA. The U.S. Army signed the ESD on 6 August 2019 and the U.S. Environmental Protection Agency (USEPA) signed the ESD on 29 August 2019. TCEQ concurred with the ESD on 23 July 2019. The Draft Final RD/RAWP for the contingency remedy was approved by TCEQ and EPA in January 2020 and presents the remedial design, inspection and maintenance requirements, and LUC requirements associated with LHAAP-50.

#### **PLANNED ACTION**

The remedy will include ISB at LHAAP-50 to remediate groundwater impacted with VOCs and perchlorate. The implementation of ISB using biogrid applications will involve the injection of an electron donor and a microbial consortium capable of biodegrading primary VOCs and perchlorate. The Material Safety Data Sheets for the injectates are included in Class V Injection Well Inventory Form, **Enclosure 1**, Attachment H. The following injectates will be used:

- An emulsified vegetable oil (EVO) product, EDS-ER™ manufactured by Tersus Environmental will be injected in the vicinity of monitoring wells 50WW14 and 50WW12 (Class V Injection Well Inventory Form, **Enclosure 1**, Attachment B, Figure 3-1). A microbial dechlorinating culture (SDC-9™), and microbial nutrients (diammonium phosphate and Vitamin B12) will be injected into the subsurface in these areas.

Per Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7, the Army is presumptively complying with substantive requirement of construction, operation and closure under 30 TAC §331, Subchapters, A, C, and H (ARARs for underground injection control).

Enclosures:

1. Class V Injection Well Inventory Form
2. TCEQ Core Data Form



**ENCLOSURE 1**

**CLASS V INJECTION WELL INVENTORY FORM**

# Texas Commission on Environmental Quality

## Class V Injection Well

### Inventory/Authorization Form

**Submit To:**

**For TCEQ Use Only**

Reg. No. \_\_\_\_\_

Date Received \_\_\_\_\_

Date Authorized \_\_\_\_\_

### Section I General Information

**Provide the information in items 1 through 7**

1. TCEQ Program Area (PST, VCP, IHW, etc.):
2. Agent/Consultant:
3. Name: Longhorn Army Ammunition Plant, LHAAP-50  
 Address (Street, City, County, State, and Zip Code) or location description (if no address is available): North central portion of LHAAP, bounded by South Crocket Avenue to the northeast, a drainage ditch to the west, a railroad spur to the south, and Goose Prairie Creek to the north.
4. Latitude and Longitude (degrees-minutes-seconds) and method of determination (GPS, TOPO, etc.) (Attach a Topographic Quadrangle map which identifies the facility location relative to major streets or roadways as Attachment A.)  
 Latitude: 32° 40' 518" N; Longitude: 94° 8' 25.569" W. LHAAP-50 Site Location Map (Figure 1-2 from the RD/RAWP) is also included in **Attachment A**.
5. Type of Well Construction (Vertical Injection, Subsurface Fluid Distribution System, Infiltration Gallery, Temporary Injection Points, etc.) and Number of Injection Wells:  
 12 direct-push temporary injection points will be used to distribute the injectate mixture into the lower shallow and upper shallow zone. Injections will be conducted in the upper shallow and lower shallow zone using 6 direct push injection points in the vicinity of monitoring well 50WW14 and injections will be conducted in the upper shallow zone using 6 direct push injection points in the vicinity of monitoring well 50WW12.
6. Description regarding purpose of Injection System. Attach a Site Map as Attachment B (Attach the Approved Remediation Plan [if appropriate]):  
 LHAAP-50, Former Sump Water Tank, contained a 47,000-gallon capacity aboveground storage tank which received industrial wastewater from various industrial waste production sumps throughout LHAAP between 1955 and 1988. The AST is no longer present.

The COCs for LHAAP-50 include dissolved phase perchlorate and VOCs including tetrachloroethene (PCE), TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride in groundwater, and perchlorate in soil. There are no COCs in other environmental media at the site. The contingency remedy described in the approved RD/RAWP is in situ bioremediation (ISB) to enhance the MNA remedy.

To implement ISB, emulsified vegetable oil (EVO), diammonium phosphate (microbial nutrient), and water will be injected into the subsurface at 12 locations shown on **Attachment B** (Figure 3-1 from the RD/RAWP). The injectate mixture will consist of approximately 2% (by volume) solution of EVO (**Attachment C**).

The Remedial Design/Remedial Action Work Plan (RD/RAWP) has been approved by TCEQ and USEPA and the approved injection plan from the RD/RAWP is included as **Attachment B**.

7. Water Well Driller/Installer:

## Section II Proposed Down Hole Design

**Attach a diagram signed and sealed by a licensed engineer as Attachment C**

| <b>Name of String</b> | <b>Size</b>            | <b>Setting Depth</b> | <b>Sacks Cement/Grout - Slurry Volume - Top of Cement</b> | <b>Hole Size</b> | <b>Weight (lbs/ft) PVC/Steel</b> |
|-----------------------|------------------------|----------------------|---|------------------|----------------------------------|
| Casing                | N/A (See Note 1 below) | N/A                  | N/A   | N/A              | N/A                              |
| Tubing                | N/A                    | N/A                  | N/A   | N/A              | N/A                              |
| Screen                | N/A                    | N/A                  | N/A   | N/A              | N/A                              |

Note 1: The injection of the amendments will be performed via direct-push injection points. The description of the direct-push injection points is provided in Section III below. There will be no permanent casing, tubing, or screens associated with the direct-push injection points.

## Section III Proposed Trench System, Subsurface Fluid Distribution System, or Infiltration Gallery

**Attach a diagram signed and sealed by a licensed engineer as Attachment D**

8. System(s) Dimensions: Approximately 6,000 square feet near monitoring wells 50WW14 and 50WW12.
9. System(s) Construction: The fluid distribution system will consist of a temporary/mobile tanks/containers, hoses, a bulk storage tank, mixing equipment, injection pump, and volume and metering control equipment. Injection points will be advanced using a tractor mounted rig with a direct-push technology (DPT) hammer. The injectate mixture will be injected using at each proposed direct-push point at 4-foot intervals in the target treatment area. Under this approach, drilling rods (injection probes) are advanced to the proposed injection interval. Injectate mixture will be pumped down through the DPT drilling rods (acting as a temporary well casing) to the injection interval and injectate will be forced through the ports in the rods to the surrounding formation. The tools are then advanced to the next injection depth and the material is again pumped through the rods. This cycle is repeated to provide coverage across the entire vertical treatment interval. Injection flow rates are expected to range from 2 to 6 gallons per minute and an attempt will be made to keep injection pressures below 25 pounds per square inch (psi).

The injection target intervals are shown in **Attachment C**, and a sample temporary DPT injection point diagram is included as **Attachment D**.

## Section IV Site Hydrogeological and Injection Zone Data

### Provide the information in items 10 through 26

10. Name of Contaminated Aquifer: Upper Shallow/Lower Shallow Aquifer
11. Receiving Formation Name of Injection Zone: Unconsolidated Material
12. Well/Trench Total Depth:  
Injection point depths in the vicinity of 50WW14 : 18-60 feet (ft) below ground surface (bgs); Injection depth in the vicinity of 50WW12: 17-35 ft bgs.
13. Surface Elevation: Approximately 191-205 ft
14. Depth to Ground Water: Shallow Zone (upper/lower shallow): 17 to 26 ft bgs; Intermediate Zone: 24 ft bgs;  
Injection Zone Depth: In the vicinity of monitoring well 50WW14: 18 to 60 ft bgs; In the vicinity of 50WW12: 17-35 ft bgs.
15. Injection Zone vertically isolated geologically? ☒Y/☐N Impervious Strata between Injection Zone and nearest Underground Source of Drinking Water:  
Name: Upper Shallow, Lower Shallow, and Intermediate Zone  
Thickness:  
Upper Shallow: 0 to 30 ft bgs  
Lower Shallow: 30 to 60 ft bgs  
Intermediate Zone: >100 ft bgs
16. Provide a list of contaminants and the levels (parts per million [ppm]) in contaminated aquifer.  
Attach as Attachment E: Perchlorate, PCE, TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride are the COCs in groundwater. See **Attachment E** showing recent (May 2018) levels of contamination in parts per billion.
17. Horizontal and Vertical extent of contamination and injection plume  
Attach as Attachment F: The horizontal extent of contamination is shown in **Attachment E**. The contamination is limited to the shallow zone. There is no impact to the intermediate zone of the aquifer. A separate Attachment F is not provided.
18. Formation (Injection Zone) Water Chemistry (Background levels) TDS, etc.  
Attach as Attachment G: Water chemistry data (dissolved oxygen, oxidation reduction potential, pH, turbidity, etc.) will be collected in the baseline sampling event and will be reported in the Remedial Action Completion Report. A separate Attachment G is not provided.
19. Injection Fluid Chemistry in ppm at point of injection  
Attach as Attachment H: The injection fluid chemistry consists of approximately 2% (by volume) solution of EVO (carbon substrate). The EVO product, EDS-ER™, will be supplied by Tersus Environmental. The approximate injectate mixture quantities are shown on the table in **Attachment C**. See **Attachment H** for Safety Data Sheet.

Water for the solution will be procured from the Leigh Water Company in Karnack, Texas from their potable water supply.

20. Lowest Known Depth of Ground Water with < 10,000 ppm TDS: Unknown
21. Maximum injection Rate/Volume/Pressure: Rate: 2 to 10 gallons per minute; Pressure: 10 to 40 psi (An attempt will be made to keep injection pressures below 25 psi). However, in some cases, depending on the lithology the injection pressure may be higher  
In the vicinity of 50WW14: Volume: 5,103 gallons per point  
In the vicinity of 50WW12: Volume: 2,188 gallons per point
22. Water wells within 1/4 mile radius (attach map as Attachment I): None
23. Injection wells within 1/4 mile radius (attach map as Attachment I): None
24. Monitor wells within 1/4 mile radius (attach driller's logs and map as Attachment I): See **Attachment I**, quarter mile map which indicates approximately 39 monitoring wells within a quarter mile radius from the planned injections. Boring logs and/or well construction logs were not available for all locations shown on the map. All the available logs are included in the attachment.
25. Sampling frequency: Quarterly performance sampling will be conducted for eight quarters following completion of injections. The sample results will be included in monitoring reports that will be submitted to TCEQ.
26. Known hazardous components in injection fluid: There are no hazardous components in the injection fluid.

## Section V Site History

### Provide the information in items 27 through 30

27. Type of Facility:

28. Contamination Dates: 1940s to 1980s

29. Original Contamination (VOCs, TPH, BTEX, etc.) and Concentrations (Attach as Attachment J): The COCs in groundwater at LHAAP-50 are Perchlorate, PCE, TCE, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride. Current concentration information is provided in **Attachment E**. No separate Attachment J is provided.

30. Previous Remediation: Attach results of any previous remediation as Attachment K.

Soil excavation of perchlorate contaminated soil was conducted in July 2013 and was documented in the Final Remedial Action Completion Report, LHAAP-50, Former Sump Water Tank dated June 2016. A separate Attachment K is not provided.

**<<NOTE>>** Authorization Form should be completed in detail and authorization given by TCEQ before construction, operation, and/or conversion can begin. Attach additional pages as necessary.

## **Attachment A**

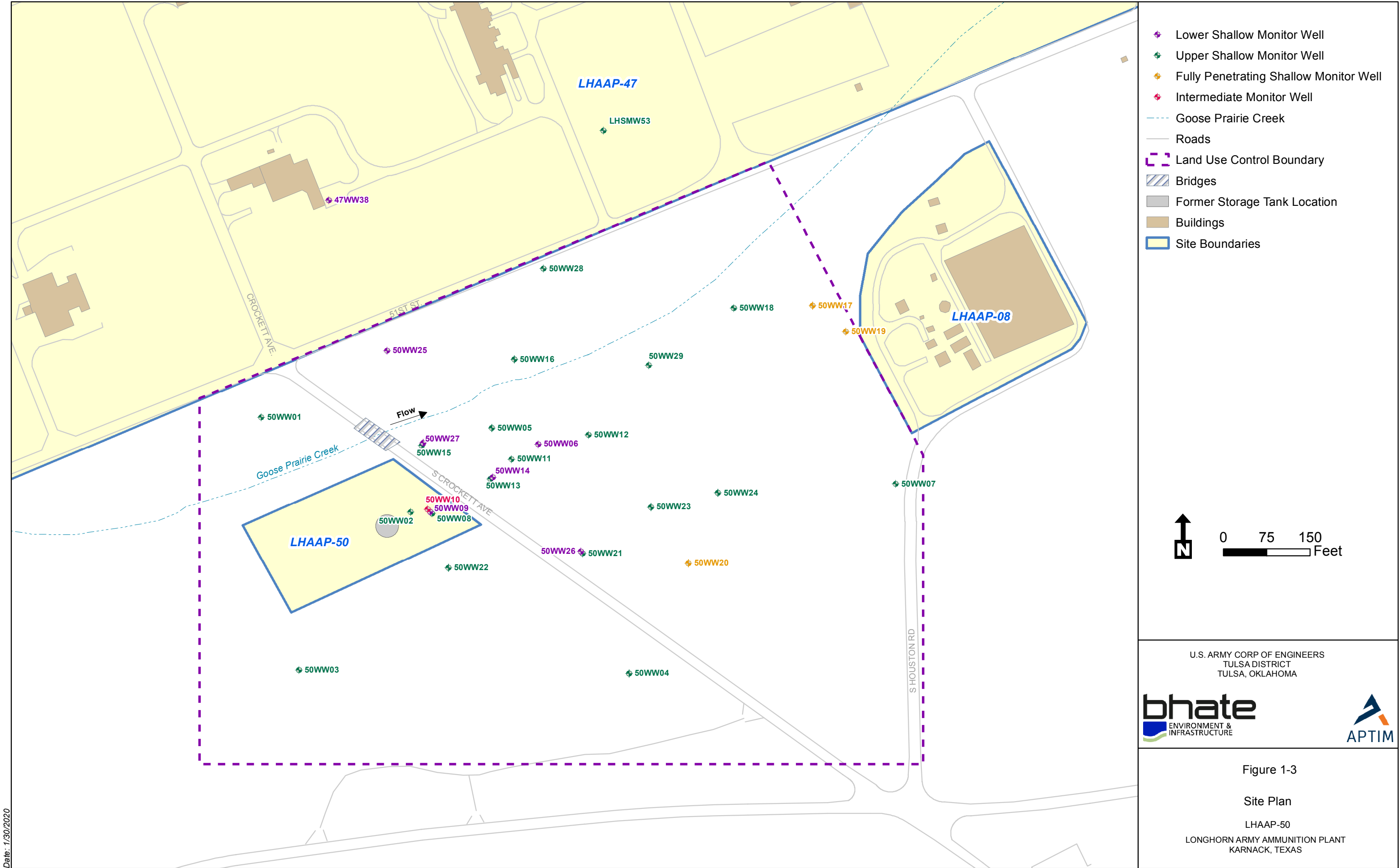
### **Site Topographic Map & Site Vicinity Map**

- **Figure 1-2, LHAAP-50 Site Location Map**
- **Figure 1-3, Site Plan, LHAAP-50**





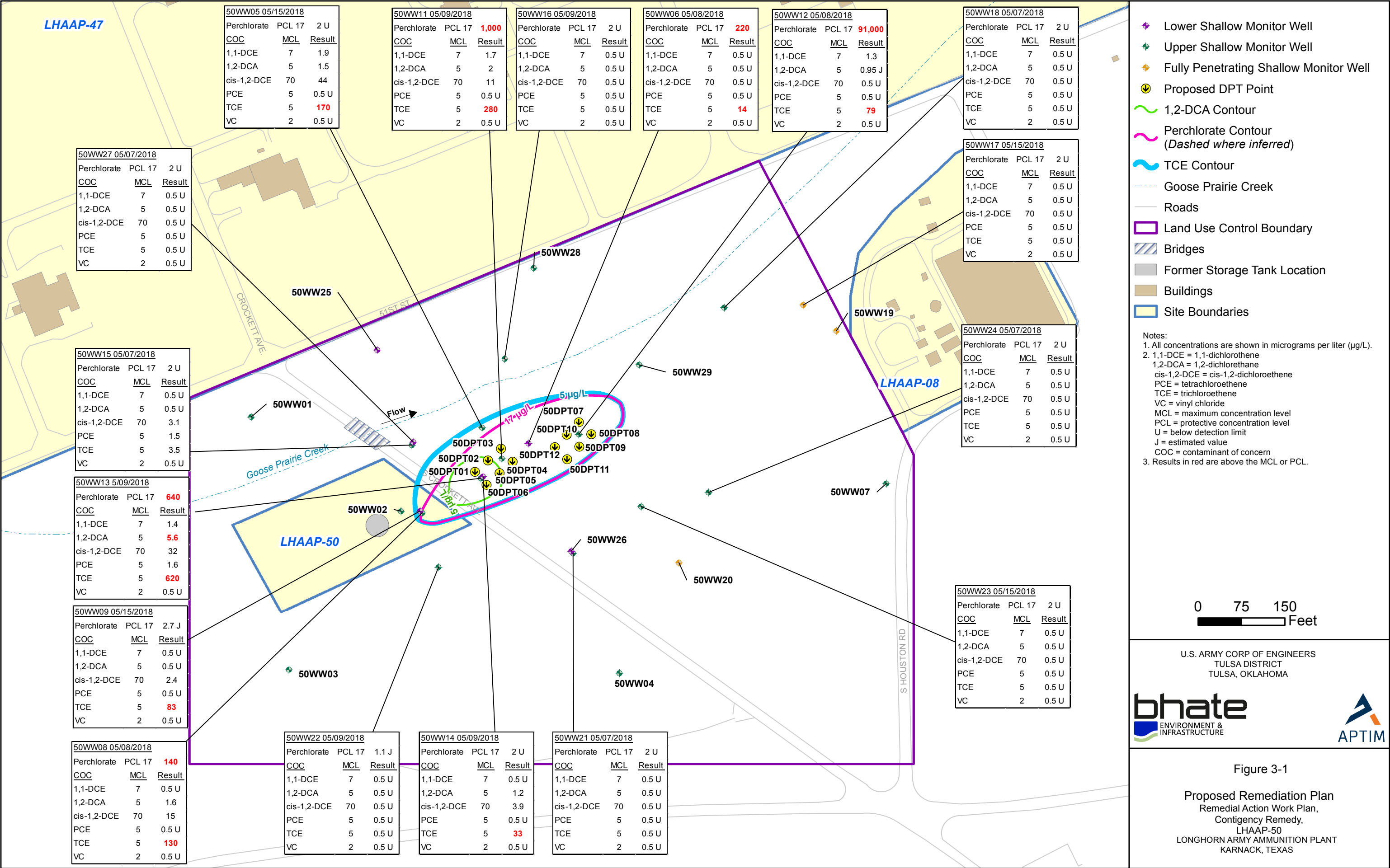




## **Attachment B**

### **Proposed Injection Locations**

- **Figure 3-1, LHAAP-50 Injection Plan, RD/RAWP**



## **Attachment C**

### **Target Injection Intervals**

- **Table 4-1, Injection Locations and Amendment Volumes, RD/RAWP**

**Table 4-1**  
**Injection Locations and Amendment Volumes**

| DPT Location | Amendment Volume per Location          |                           |                           |                                       |                  |                                  | DPT Injection Depths (ft bgs) <sup>a</sup> | Nearest Monitoring Well | Lithology (ft bgs)  |
|--------------|--|---------------------------|---------------------------|---------------------------------------|------------------|----------------------------------|--|-------------------------|---|
|              | Gallons of EVO (EDS-ER™ or Equivalent) | Liters of SDC-9™ (1.0E11) | Pounds of Nutrients (DAP) | Pounds of Buffer (sodium bicarbonate) | Gallons of Water | Total Injection Volume (gallons) |  |                         |   |
| 50DPT01      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    | 50WW14                  | 0 - 2 ft bgs: Silty fine sand<br>2 - 15 ft bgs: Silty clay<br>15 - 30 ft bgs: Silty fine sand<br>30 - 61.5 ft bgs: Poorly graded sand with silt<br>58.5 ft bgs: Bottom of well casing |
| 50DPT02      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    |                         |   |
| 50DPT03      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    |                         |   |
| 50DPT04      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    |                         |   |
| 50DPT05      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    |                         |   |
| 50DPT06      | 110                                    | 12                        | 308                       | 37                                    | 4,990            | 5,103                            | 18 - 60                                    |                         |   |
| 50DPT07      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    | 50WW12                  | 0 - 2 ft bgs: Silt<br>2 - 10 ft bgs: Lean clay with sand<br>10 - 35 ft bgs: Poorly graded sand  |
| 50DPT08      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    |                         |   |
| 50DPT09      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    |                         |   |
| 50DPT10      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    |                         |   |
| 50DPT11      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    |                         |   |
| 50DPT12      | 48                                     | 5                         | 132                       | 16                                    | 2,139            | 2,188                            | 17 - 35                                    |                         |   |

Notes:

Table will be updated with quantities of buffer (Sodium Bicarbonate) which will be determined based on buffer capacity tests.

<sup>a</sup> The DPT injection depths may be altered in the field depending on lithology.

DAP - Diammonium Phosphate

DPT - direct-push technology

EDS-ER™ - electron donor solution-extended release

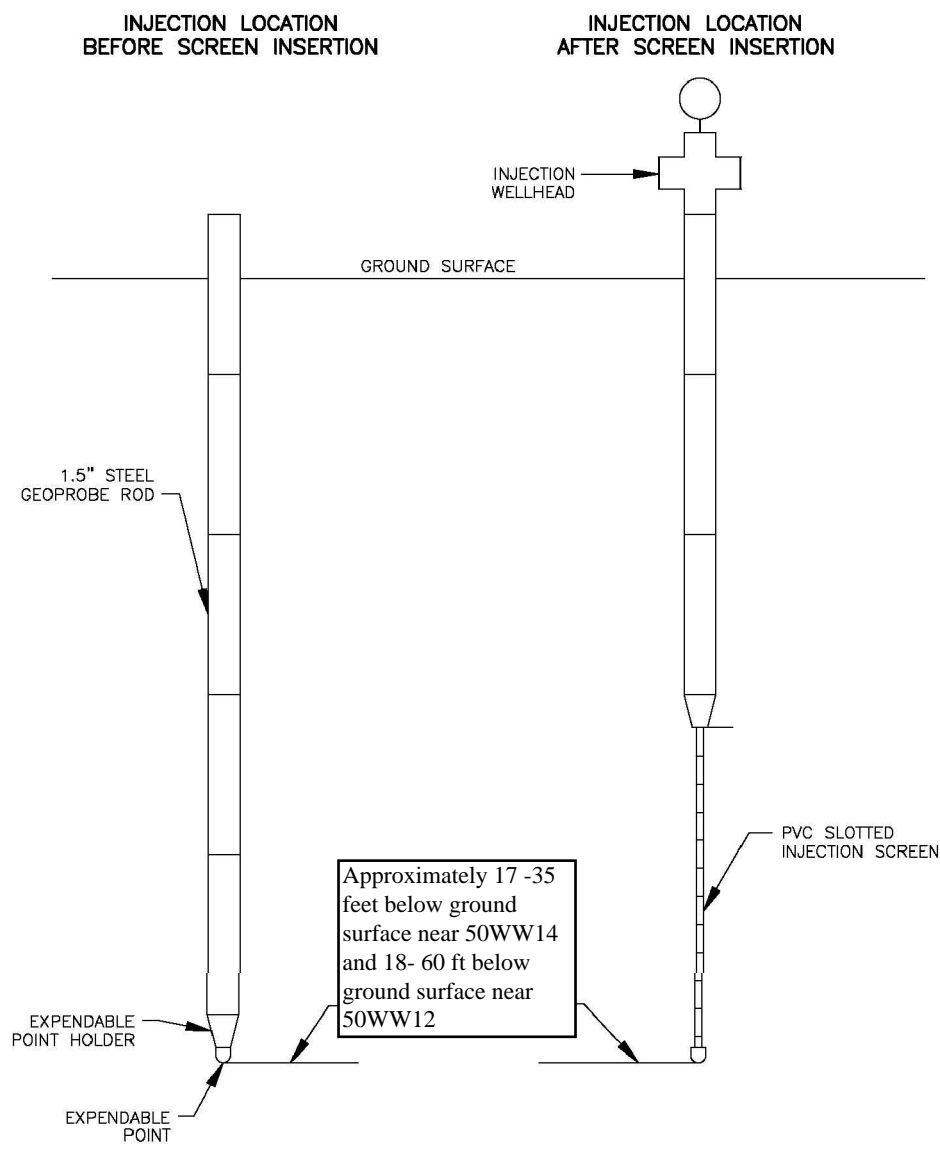
EVO - emulsified vegetable oil

ft bgs - feet below ground surface

SDC-9™ - APTIM's dechlorinating culture

**Attachment D**

**Typical DPT Temporary Injection Point Diagram**



Not to Scale

Project Number: 501032



**Attachment D**  
**Typical DPT Temporary Injection Point**  
**Diagram**

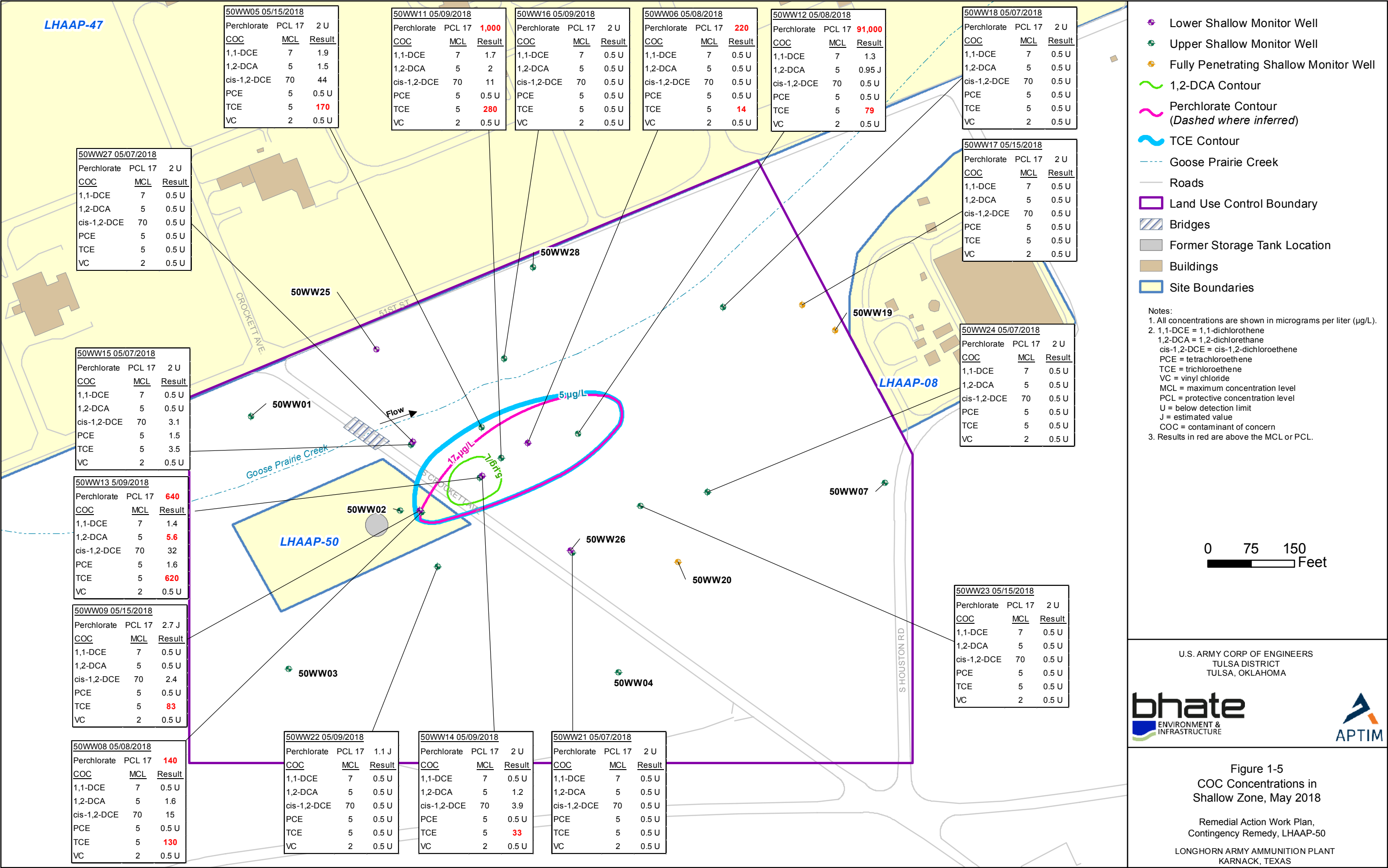
**Longhorn Army Ammunition Plant**  
**Karnack, Texas**



## **Attachment E**

### **COC Concentrations in Shallow Groundwater**

- **Figure 1-5, COC Concentrations in Shallow Groundwater at LHAAP-50, RD/RAWP**



**Attachment F**  
**Not Applicable**

**Attachment G**  
**Not Applicable**

# **Attachment H**

## **Safety Data Sheets**

- **Electron Donor Solution (EDS-ER™)**



## Material Safety Data Sheet

## Electron Donor Solution

## Section 1: Chemical Product and Company Identification

**Product Name:** Electron Donor Solution  
 Extended Release  
**Catalog Codes:** EDS-ER  
**CAS#:** 8001-22-7  
**TSCA:** TSCA 8(b) inventory: Soybean oil  
**HMIS Code:** H F R P: 10 0 A  
**Trade Name and Synonyms:** EDS-ER  
**Chemical Family:** Glyceride Oils

**Contact Information:**  
 Tersus Environmental, LLC  
 109 E. 17th Street, Suite #3880  
 Cheyenne, WY 82001  
 Ph: 307.638.2822 • info@tersusenv.com  
 www.tersusenv.com  
**For emergency assistance, call:** 919.638.7892

## Section 2: Composition and Information on Ingredients

| COMPONANT                                  | CAS #        | OSHA<br>TWA | OSHA<br>STEL         | ACGIH<br>TWA | ACGIH<br>STEL |
|--|--------------|-------------|----------------------|--------------|---------------|
| Soybean Oil                                | 8001-22-7    | ---         | 10 mg/m <sup>3</sup> | ---          | ---           |
| Vegetable Oil Derived Fatty<br>Acid Esters | Confidential | ---         | ---                  | ---          | ---           |

HAZARDOUS INGREDIENTS: NONE AS DEFINED UNDER THE U.S. OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) OR THE CANADIAN HAZARDOUS PRODUCTS ACT S.C. 1987, C.30 (PART 1).

THE PRECISE COMPOSITION OF THIS PRODUCT IS PROPRIETARY INFORMATION. A MORE COMPLETE DISCLOSURE WILL BE PROVIDED TO A PHYSICIAN IN THE EVENT OF A MEDICAL EMERGENCY.

SARA HAZARD: NONE NOTED (SECTION 311/312) TITLE III SECTION 313 - NOT LISTED  
 All components of this product are listed on the TSCA registry.

## Section 3: Physical/Chemical Characteristics

BOILING RANGE: Not applicable VAPOR DENSITY: Exceeds 1.0

SPECIFIC GRAVITY (H<sub>2</sub>O=1.0): 0.92 - 0.925 VAPOR PRESSURE: Not applicable

PERCENT VOLATILE BY VOLUME: 0% SOLUBILITY IN WATER: Miscible

EVAPORATION RATE: Not applicable

APPEARANCE AND ODOR: A pale yellow, oily liquid - only a faint odor.

WEIGHT PER GALLON: 7.7 lbs. at 60F.



## Material Safety Data Sheet

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### Section 4: Fire and Explosion Data

FLAMMABILITY CLASSIFICATION: Combustible Liquid - Class IIIB.

FLASHPOINT: Greater than 550 F (288 C).

METHOD USED: Tag Closed Cup.

EXTINGUISHING MEDIA: CO<sub>2</sub>, dry chemical, foam, sand.

SPECIAL FIREFIGHTING PROCEDURES: Avoid use of water as it may spread fire by dispersing oil.

Use water to keep fire-exposed containers cool. Water spray may be used to flush spills away from fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Rags soaked with any oil or solvent can present a fire hazard and should always be stored in UL Listed or Factory Mutual approved, covered containers. Improperly stored rags can create conditions that lead to oxidation. Oxidation, under certain conditions can lead to spontaneous combustion.

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### Section 5: Reactivity Data

STABILITY: Generally stable. Spontaneous combustion can occur. See Unusual Fire and Explosion Procedures, Section IV.

CONDITIONS TO AVOID: High surface area exposure to oxygen can result in polymerization and release of heat.

INCOMPATIBILITY (MATERIALS TO AVOID): Avoid contact with strong oxidizing agents.

HAZARDOUS DECOMPOSITIONS OR BY-PRODUCTS: Decomposition may produce carbon dioxide and carbon monoxide.

HAZARDOUS POLYMERIZATION: Will not occur.

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### Section 6: Health Hazard Data

THRESHOLD LIMIT VALUE: As a liquid - none. As oil mist - 10 mg/m<sup>3</sup> total particulate.

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: Excessive inhalation of oil mist may affect the respiratory system. Oil mist is classified as a nuisance particulate by ACGIH.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE: Not classified as a primary skin irritant or corrosive material. Sensitive individuals may experience dermatitis after long exposure of oil on skin.

HEALTH HAZARDS (ACUTE AND CHRONIC): Acute: none observed by inhalation. Chronic: none reported.

#### EMERGENCY AND FIRST AID PROCEDURES FOR:

SKIN CONTACT: May be removed from skin by washing with soap and warm water.

EYE CONTACT: Immediately flush eyes with plenty of cool water for at least 15 minutes. Do NOT let victim rub eyes.

INHALATION: Immediately remove exposed individual to fresh air source. If victim has stopped breathing give artificial respiration, get medical attention immediately.



## Material Safety Data Sheet

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### Section 7: Precautions for Safe Handling and Use

**ENVIRONMENTAL PRECAUTIONS:** Where large spills are possible, a comprehensive spill response plan should be developed and implemented.

**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:** Wear appropriate respiratory protection and protective clothing as described in section VIII. Depending on quantity of spill: (a) Small spill - add solid adsorbent, shovel into disposable container and wash the area. Clean area with detergent. (b) Large spill - Squeegee or pump into holding container. Clean area with detergent. In the event of an uncontrolled release of this material, the user should determine if this release is reportable under applicable laws and regulations.

**WASTE DISPOSAL METHOD:** All recovered material should be packaged, labeled, transported, and disposed or reclaimed in accordance with local, state, and federal regulations and good engineering practices.

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### Section 8: Control Measures

**RESPIRATORY PROTECTION:** Not normally needed. A qualified health specialist should evaluate whether there is a need for respiratory protection under specific conditions.

**VENTILATION:** Handle in the presence of adequate ventilation. Intermittent clean air exchanges recommended, but not required.

**PROTECTIVE GLOVES:** Not normally needed. However, protective clothing is always recommended when handling chemicals.

**EYE PROTECTION:** Eye protection is always recommended when handling chemicals. Wear safety glasses meeting the specifications established in ANSI Standard Z87.1.

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### Section 9: Special Precautions

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Store away from flame, fire, and excessive heat.

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### Section 10: Disposal Considerations

**General Information:** Do not discharge into drains, watercourses or onto the ground. Discharge, treatment, or disposal may be subject to national, state, or local laws. Empty containers may contain product residues.

**Disposal Methods:** No specific disposal method required.

**Container:** Since emptied containers retain product residue, follow label warnings even after container is emptied.





## Material Safety Data Sheet

### Section 11: Transportation Information

DOT Not regulated.  
 TDG Not regulated.  
 IATA Not regulated.  
 IMDG Not regulated.

### Section 12: Other Information

#### Hazard Ratings

|             | Health Hazard | Fire Hazard | Instability | Special Hazard |
|-------------|---------------|-------------|-------------|----------------|
| <b>NFPA</b> | 1             | 1           | 0           | NONE           |

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

NFPA Label colored diamond code: Blue - Health; Red - Flammability; Yellow - Instability; White - Special Hazards

|             | Health Hazard | Flammability | Physical Hazard | Personal Protection |
|-------------|---------------|--------------|-----------------|---------------------|
| <b>HMIS</b> | 1             | 1            | 0               | --                  |

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

HMIS Label colored bar code: Blue - Health; Red - Flammability; Orange - Physical Hazards; White - Special

### Section 13: Disclaimer and/or Comments

We suggest that containers be either professionally reconditioned for re-use by certified firms or properly disposed of by certified firms to help reduce the possibility of an accident. Disposal of containers should be in accordance with applicable federal, state and local laws and regulations. "Empty" drums should not be given to individuals.

The conditions of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product.

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## Safety Data Sheet

### SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: DHC microbial consortium (SDC-9)

Manufacturer Aptim 17 Princess Road, Lawrenceville,  
NJ 08648. Phone (609) 895-5340

CAS #: N/A (Not Applicable)

Product Use: For remediation of contaminated groundwater (environmental applications).

Material Description: Non-toxic, naturally occurring, non-pathogenic, non-genetically altered anaerobic microbes in a water-based medium.

**IN CASE OF EMERGENCY CALL CHEMTREC 24 HOUR EMERGENCY RESPONSE PHONE NUMBER (800) 424-9300**

### SECTION 2 – COMPOSITIONS AND INFORMATION ON INGREDIENTS

| Components                | %   | OSHA<br>PEL | ACGIH<br>TLV | OTHER<br>LIMITS |
|---------------------------|-----|-------------|--------------|-----------------|
| Non-Hazardous Ingredients | 100 | N/A         | N/A          | N/A             |

Based on Microbial Insights QuantArray® analysis, the DHC microbial consortium (SDC-9) is comprised of microorganisms of the genera *Dehalococcoides*, *Desulfovibrio*, *Desulfitobacterium*, *Dehalobium*, and *Dehalobacter* as well as sulfate reducing bacteria and methanogenic archaeobacteria.

### SECTION 3 – HAZARDS IDENTIFICATION

The available data indicates no known hazards associated with exposure to this product. Nevertheless, individuals who are allergic to enzymes or other related proteins should avoid exposure and handling. Health effects associated with exposure to similar organisms are listed below.

Ingestion: Ingestion of large quantities may result in abdominal discomfort including nausea, vomiting, cramps, diarrhea, and fever.

Inhalation: Hypersensitive individuals may experience breathing difficulties after inhalation of aerosols.

Skin Absorption: May cause irritation upon prolonged contact. Hypersensitive individuals may experience allergic reactions.

Eye contact: May cause irritation unless immediately rinsed.

**SECTION 4 – FIRST-AID MEASURES**

**Ingestion:** Thoroughly rinse mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Get immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

**Inhalation:** Get medical attention if allergic symptoms develop.

**Skin Absorption:** N/A

**Skin Contact:** Wash affected area with soap and water. Get medical attention if allergic symptoms develop.

**Eye Contact:** Flush eyes with plenty of water for at least 15 minutes using an eyewash fountain, if available. Get medical attention if irritation occurs.

**NOTE TO PHYSICIANS:** All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this material may have occurred.

**SECTION 5 – FIRE-FIGHTING MEASURES**

**Flammability of the Product:** Non-flammable

**Flash Point:** N/A

**Flammable Limits:** N/A

**Fire Hazard in Presence of Various Substances:** N/A

**Explosion Hazard in Presence of Various Substances:** N/A

**Extinguishing Media:** Foam, carbon dioxide, water

**Special Fire Fighting Procedures:** None

**Unusual Fire and Explosion Hazards:** None

**SECTION 6 – ACCIDENTAL RELEASE MEASURES**

**Reportable quantities (in lbs of EPA Hazardous Substances):** N/A

No emergency results from spillage. However, spills should be cleaned up promptly. Absorb with an inert material and put the spilled material in an appropriate waste disposal container. All personnel involved in the cleanup must wear protective clothing and avoid skin contact. After clean-up, disinfect all cleaning materials and storage containers that come in contact with the spilled liquid.

## SECTION 7 – HANDLING AND STORAGE

Avoid breathing breathe aerosol. Avoid contact with skin. Use personal protective equipment recommended in Section 8.

Keep containers tightly closed in a cool, well-ventilated area. The DHC microbial consortium (SDC-9) is typically supplied in stainless steel kegs equipped with pressure relief valves. The kegs are pressurized with Nitrogen gas (N<sub>2</sub>) up to the pressure of 15 psi. **Do not exceed pressure of 15 psi during transfer of DHC microbial consortium (SDC-9) from kegs.** Don't open keg if content of the keg is under pressure.

DHC microbial consortium (SDC-9) may be stored for up to 4 weeks at temperature 2-4°C without aeration. Avoid freezing.

## SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Hand Protection: Rubber, nitrile, or vinyl gloves.

Eye Protection: Safety goggles or glasses with side splash shields.

Protective Clothing: Use adequate clothing to prevent skin contact.

Respiratory Protection: N95 respirator if aerosols might be generated.

Ventilation: Provide adequate ventilation to remove odors.

Other Precautions: An eyewash station in the work area is recommended.

## SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

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Physical state and appearance: Light greenish murky liquid. Musty odor.

Boiling Point: 100°C (water)

Specific Gravity (H<sub>2</sub>O = 1): 0.9 - 1.1

Vapor Pressure @ 25°C: 24 mm Hg (water)

Melting Point: 0°C (water)

Vapor Density: N/A

Evaporation Rate (H<sub>2</sub>O = 1): 0.9 - 1.1

Solubility in Water: Soluble

Water Reactive: No

pH: 6.0 - 8.0

## SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable

Conditions to Avoid: None

Incompatibility (Materials to Avoid): Water-reactive materials

Hazardous Decomposition Byproducts: None

## **SECTION 11 – TOXICOLOGICAL INFORMATION**

This product contains no toxic ingredients.

SDC-9 consortium has tested negative for pathogenic microorganisms such as *Bacillus cereus*, *Listeria monocytogens*, *Salmonella* sp., Fecal Coliforms, Total Coliforms, Yeast and Mold and *Pseudomonas* sp.

## **SECTION 12 – ECOLOGICAL INFORMATION**

Ecotoxicity: this material will degrade in the environment.

## **SECTION 13 – DISPOSAL CONSIDERATIONS**

Waste Disposal Method: No special disposal methods are required. The material is compatible with all known biological treatment methods. To reduce odors and permanently inactivate microorganisms, mix 100 parts (by volume) of SDC-9 consortium with 1 part (by volume) of bleach. Dispose of in accordance with local, state and federal regulations.

## **SECTION 14 – TRANSPORT INFORMATION**

DOT Classification: N/A  
Labeling: NA  
Shipping Name: Not regulated

## **SECTION 15 – REGULATORY INFORMATION**

Federal and State Regulations: N/A

## **SECTION 16 – OTHER INFORMATION**

MSDS Code: ENV 1033  
MSDS Creation Date: 10/06/2003  
Last Revised: March 15, 2019.

While the information and recommendations set forth herein are believed to be accurate as of the date hereof, APTIM MAKES NO WARRANTY WITH RESPECT HERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

**Attachment I**

**Quarter Mile Radius Map  
and Boring Logs**

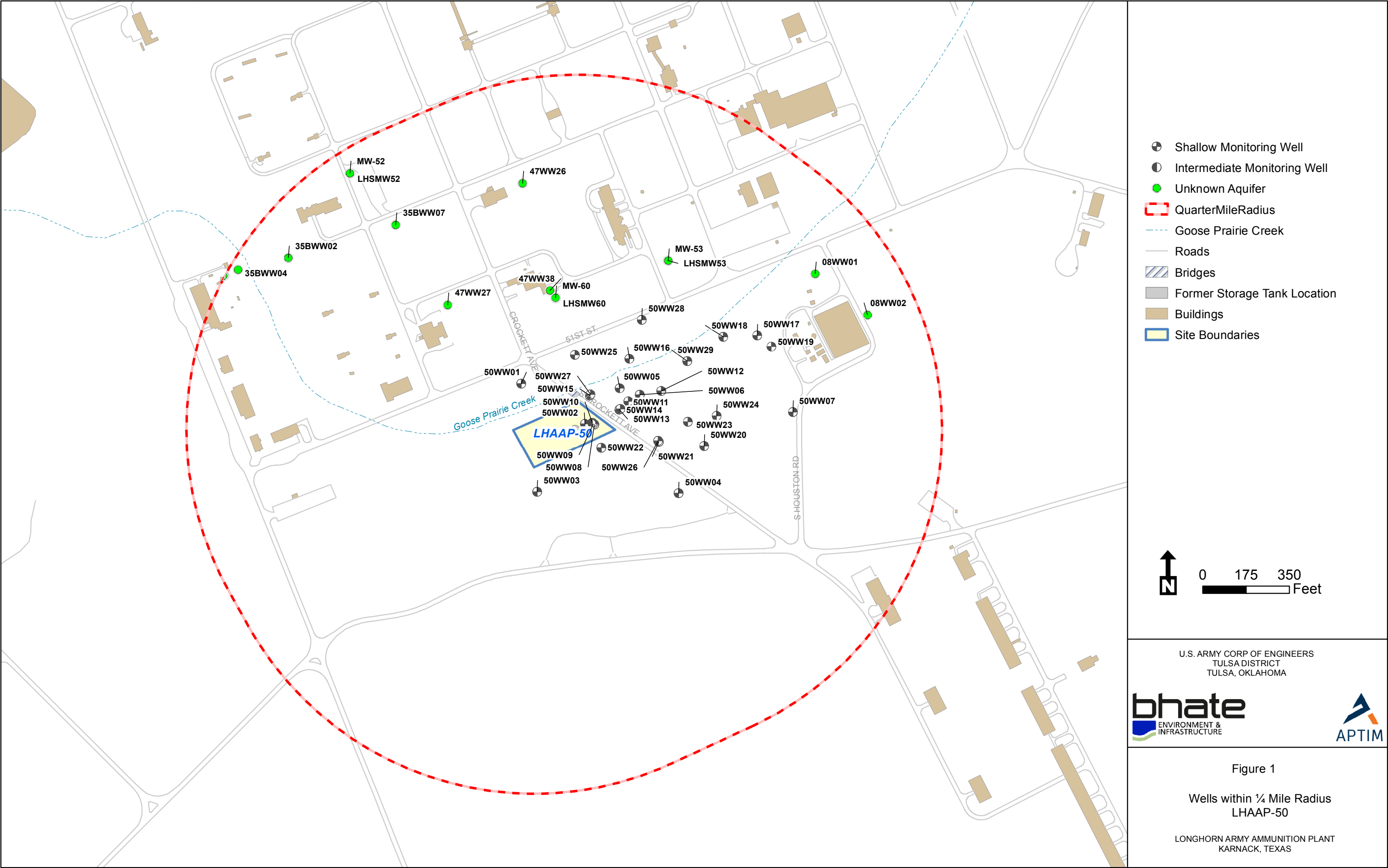


Figure 1

Wells within 1/4 Mile Radius  
LHAAP-50

LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

Hole No. 35BWW02

|   |  |                                   |                        |
|---|--|-----------------------------------|------------------------|
| DRILLING LOG  | DIVISION<br>USACE Tulsa  | INSTALLATION<br>LHAAP Karnack, TX | SHEET 1<br>OF 2 SHEETS |
| PROJECT<br>LHAAP Site 35B   | 10. SIZE AND TYPE OF BIT<br>1 1/2" HSA                                       |                                   |                        |
| LOCATION (Coordinates or Station)   | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)                                   |                                   |                        |
| DRILLING AGENCY<br>CPI, Inc. Tulsa, TX  | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>CME-75 3 1/2" HSA / 3 1/2" OD HSA |                                   |                        |
| WELL NO. (As shown on drawing title and file number)<br>35BWW02   | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN<br>12                             |                                   |                        |
| NAME OF DRILLER<br>Jose Landeros  | 14. TOTAL NUMBER CORE BOXES<br>1A  |                                   |                        |
| DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. | 15. ELEVATION GROUND WATER<br>-  |                                   |                        |
| THICKNESS OF OVERBURDEN   | 16. DATE HOLE<br>8-31-88   |                                   |                        |
| DEPTH DRILLED INTO ROCK   | 17. ELEVATION TOP OF HOLE<br>-   |                                   |                        |
| TOTAL DEPTH OF HOLE   | 18. TOTAL CORE RECOVERY FOR BORING<br>1A                                     |                                   |                        |
|   | 19. SIGNATURE OF INSPECTOR<br>B B  |                                   |                        |

| ELEVATION<br>a | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d  | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|----------------|------------|-------------|--|-------------------------|------------------------------|---|
|                | 1          | CL          | silty clay - dark brown w/ some light brown (mottled) silt<br>loamy silt (dry)   | 3.5'<br>of<br>4.0'      | SS#1<br>0.0'<br>to<br>4.0'   | Commenced @ 1325<br><br>fine sand<br><br>Sample = 2ppm                                    |
|                | 2          |             |  |                         |                              |   |
|                | 3          |             |  |                         |                              |   |
|                | 4          | CL          | silty clay - lt grey full brown w/<br>some orange staining (mottled)<br>(still friable) (dry)  |                         |                              |   |
|                | 5          |             |  |                         |                              |   |
|                | 6          | SM          | silty sand - lt grey sand w/<br>high silt content low plasticity<br>soft and friable throughout<br>(dry)   | 5.0'<br>of<br>5.0'      | SS#2<br>4.0'<br>to<br>9.0'   | Sample =  |
|                | 7          |             | high fine content from 7' to 8'<br>fine increases again from 8' down to 10.5'  |                         |                              |   |
|                | 8          |             | grades into CL at 10.5'  |                         |                              |   |
|                | 9          |             |  |                         |                              |   |
|                | 10         |             |  |                         |                              |   |
|                | 11         | CL          | silty clay - grey till w/ orange<br>staining (mottled) moderate plasticity<br>(moist)  | 5.0'<br>of<br>5.0'      | SS#3<br>9.0'<br>to<br>14.0'  | Sample = 4ppm   |
|                | 12         |             |  |                         |                              |   |
|                | 13         | SM          | silty sand/candy silt - grey to dark<br>grey silty sand w/ no plasticity<br>soft to very soft (free water)<br>gradual into CL around 14 to 14.1' |                         |                              |   |
|                | 14         |             |  |                         |                              |   |
|                | 15         | CL          | silty sandy clay - med grey to lt grey<br>orange staining (moist)<br>thin layer of hard shale like clay<br>about 2" thick                        |                         |                              |   |
|                | 16         | SP          | poorly sorted sand - lt grey to<br>grey sand w/ some silt<br>no plasticity very soft +<br>some orange staining<br>(free water)                   | 2.5'<br>of<br>5.0'      | SS#4<br>14.0'<br>to<br>19.0' |   |
|                | 17         |             |  |                         |                              |   |
|                | 18         |             |  |                         |                              |   |
|                | 19         |             |  |                         |                              |   |
|                |            |             |  | 2.0'<br>of<br>4.0'      | SS#5<br>19.0'<br>to<br>20.2' |   |

000104



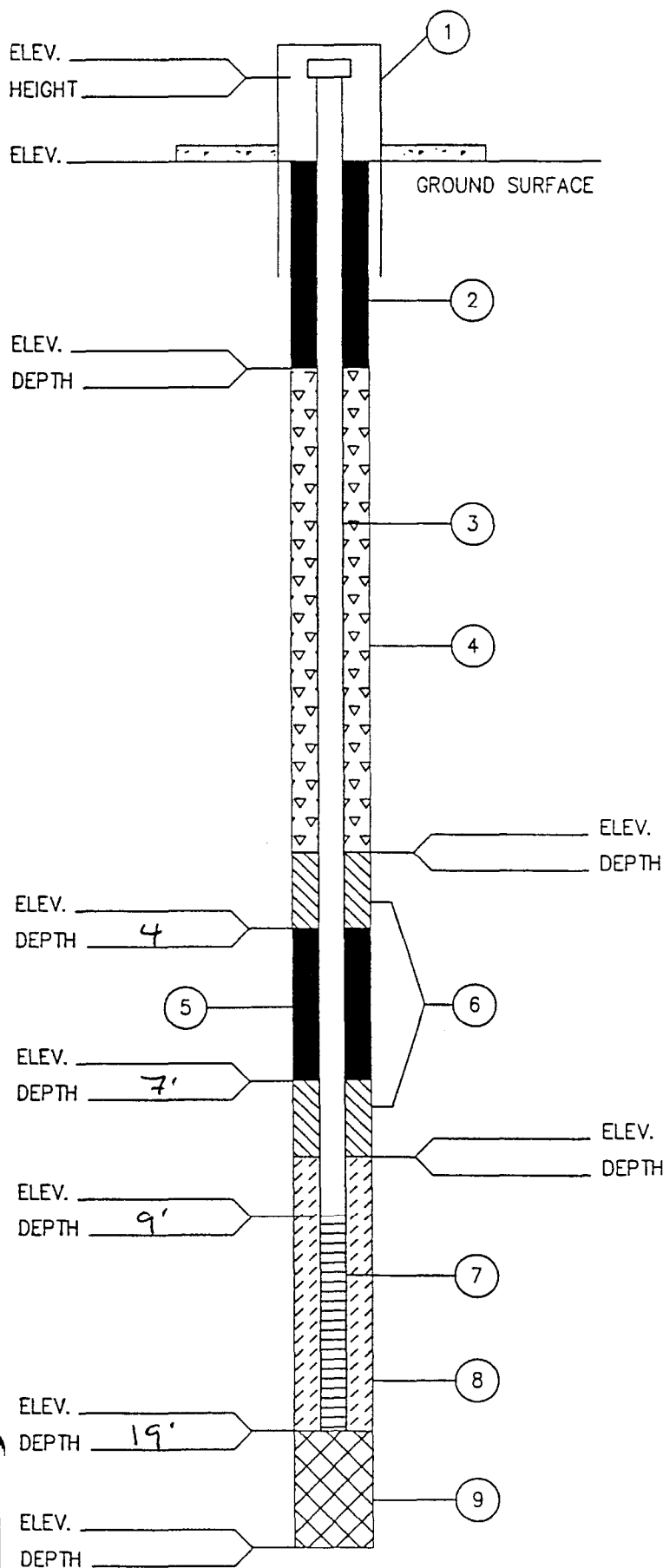
| DRILLING LOG (Cont Sheet) |            |             | ELEVATION TOP OF HOLE  |                       | Hole No. 35R1002              |   |
|---------------------------|------------|-------------|--|-----------------------|-------------------------------|---|
| PROJECT                   |            |             | INSTALLATION   |                       |                               | SHEET 1<br>OF 2 SHEETS  |
| ELEVATION<br>a            | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d  | % CORE<br>RECOV.<br>e | BOX OR<br>SAMPLE<br>NO.<br>f  | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|                           | 20         | SM          | Silty sand - orange-brown to light gray<br>(mostly) silty sand w/ some gravel<br>around 20.2' (soft to stiff)<br>no plasticity (wet) | 2.0'<br>of<br>2.0'    | SS#5<br>19.0'<br>to<br>20.0'  |   |
|                           | 21         | SM          | Silty clayey sand - light gray to orange<br>brown - sand with lots of fines.<br>(no plasticity) soft to very soft<br>free water      | 2.0'<br>to<br>2.0'    | SS#6<br>21.0'<br>to<br>22.0'  |   |
|                           | 22         | SM          | Silty sand - light to light brown<br>silty sand no plasticity<br>very soft (free water)  | 5.0'<br>of<br>2.0'    | SS#7<br>23.0'<br>to<br>25.0'  |   |
|                           | 23         | SM          | As above   | 2.0'<br>of<br>2.0'    | SS#8<br>25.0'<br>to<br>27.0'  |   |
|                           | 24         | SM          | As above   | 2.0'<br>of<br>2.0'    | SS#9<br>27.0'<br>to<br>29.0'  |   |
|                           | 25         | SM          |  |                       |                               |   |
|                           | 26         | SM          |  |                       |                               |   |
|                           | 27         | SM          |  |                       |                               |   |
|                           | 28         | SM          |  |                       |                               |   |
|                           | 29         | SM          |  |                       |                               |   |
|                           | 30         | SM          |  |                       |                               |   |
|                           | 31         | SM          |  |                       |                               |   |
|                           | 32         | SM          |  |                       |                               |   |
|                           | 33         | SM          | Silty clayey sand - light to light<br>brown w/ a purple tint<br>soft + free water  |                       |                               |   |
|                           | 34         | SC          |  |                       |                               |   |
|                           | 35         | SM          | Silty sand - light brown n. sand<br>w/ some fines, increase towards<br>bottom (soft free water)                                      | 5.0'<br>of<br>5.0'    | SS#10<br>29.0'<br>to<br>34.0' |   |
|                           | 36         | SM          |  |                       |                               |   |
|                           | 37         | SM          |  |                       |                               |   |
|                           | 38         | SM          |  |                       |                               |   |
|                           | 39         | SM          | As above   |                       |                               |   |
|                           | 40         | SM          | free water   | 5.0'<br>of<br>5.0'    | SS#12<br>35.0'<br>to<br>44.0' |   |
|                           | 41         | SM          |  |                       |                               |   |
|                           | 42         | SM          | thin clay layer - (mod. stiff to stiff)<br>light gray clay - (wet)<br>light gray silty sand - soft + free water no plasticity        |                       |                               |   |

000205

| DRILLING LOG   |  | DIVISION<br>USACE-Tulsa | INSTALLATION<br>LHAAP-Kornack, TX  |  | SHEET 1<br>OF 1 SHEETS     |  |
|--|--|-------------------------|--|--|----------------------------|--|
| 1. PROJECT<br>LHAAP Supplemental RI Site 47  |  |                         | 10. SIZE AND TYPE OF BIT<br>Hazen Bits                                   |  |                            |  |
| 2. LOCATION (Coordinate or Station)  |  |                         | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)                               |  |                            |  |
| 3. DRILLING AGENCY<br>ETTL - Tyler, TX   |  |                         | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>Mobile B-51 / S'cent. sampler |  |                            |  |
| 4. HOLE NO. (As shown on drawing title and file number)<br>47WW26  |  |                         | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN<br>4                          |  | DISTURBED<br>0             |  |
| 5. NAME OF DRILLER<br>Tom Cook   |  |                         | 14. TOTAL NUMBER CORE BOXES<br>N/A                                       |  | 15. ELEVATION GROUND WATER |  |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |  |                         | 16. DATE HOLE<br>12-2-00   |  | STARTED<br>12-2-00         |  |
| 7. THICKNESS OF OVERBURDEN<br>Penetrated 19.0'   |  |                         | 17. ELEVATION TOP OF HOLE  |  |                            |  |
| 8. DEPTH DRILLED INTO ROCK<br>N/A  |  |                         | 18. TOTAL CORE RECOVERY FOR BORING<br>N/A %                              |  |                            |  |
| 9. TOTAL DEPTH OF HOLE<br>19.0' below grade  |  |                         | 19. SIGNATURE OF INSPECTOR<br>and PG                                     |  |                            |  |

| ELEVATION<br>a | DEPTH<br>(ft.)<br>b | USE<br>LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d   | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g              |
|----------------|---------------------|--------------------|---|-------------------------|------------------------------|--|
|                | 1                   | CL                 | Silty Clay Lt. gray and brown with some Lt. to dark orange-brown mottling, trace roots and fine sand - Moist (st.H)   | 3.3/                    | SS #1                        | 1038 Commenced HSA pilot hole $\approx 4\frac{1}{4}$ " I.D. HSA  |
|                | 2                   |                    |   | 4.0                     | 0.0 to 4.0'                  | HNU Reading in Sampler = 0ppm  |
|                | 3                   |                    |   |                         |                              | HNU Reading @ Augers = 0ppm  |
|                | 4                   |                    |   |                         |                              | Ambient air = 0ppm   |
|                | 5                   |                    | Silty Clay Lt. gray, brown and reddish-brown (mottled) with some dark rust colored streaking and staining, plastic, trace to some fine sand throughout sample - Damp to Moist (v. st.H)                                       | 4.9/                    | SS #2                        | HNU Reading in Sampler = 0ppm  |
|                | 6                   |                    |   | 5.0                     | 4.0 to 9.0'                  | HNU Reading @ Augers = 0ppm  |
|                | 7                   |                    |   |                         |                              | Ambient air = 0ppm   |
|                | 8                   |                    |   |                         |                              |  |
|                | 9                   |                    | Silty Clay - Lt. gray, brown, yellow-brown, and some dark orange-brown - mottled and horiz. layered U. thin bedded, occ. some small ( $\frac{1}{16}$ ") block incl., trace to some fine sand throughout sample - Moist (st.H) | 5.0/                    | SS #3                        | HNU Reading in Sampler = 0ppm  |
|                | 10                  |                    |   | 5.0                     | 9.0 to 14.0'                 | HNU Reading @ Augers = 0ppm  |
|                | 11                  |                    |   |                         |                              | No obvious odors in samples  |
|                | 12                  |                    |   |                         |                              | Ambient air = 0ppm   |
|                | 13                  |                    |   |                         |                              |  |
|                | 14                  |                    |   |                         |                              | HNU Reading in Sampler = 0ppm  |
|                | 15                  | SM                 | Sandy Silt - Lt. to med. gray with some orange and yellow-brown mottling, fine grained sand, some sl. clayey - Wet/Saturated  | 5.0/                    | SS #4                        | 1120 commenced overdrilling pilot hole $\approx 11$ " O.D. HSA ("plugged") for 4" SS well construction |
|                | 16                  |                    |   | 5.0                     | 14.0 to 19.0'                | - Bent/concent grout 4' to grade   |
|                | 17                  | SP                 | Grating into fine sand (Wet) @ 16.7'  |                         |                              | - Bent. scol 7' to 4' (20-40)  |
|                | 18                  | CL                 | Silty Clay Lt. brown, gray and blue-gray mottled, plastic, trace to some fine sand - Damp to Moist (v. st.H)  |                         |                              | - Sand fill/terrac 19' to 7'   |
|                | 19                  |                    |   |                         |                              | - 4" SS (304) #10 slot screen 19' to 9'  |
|                |                     |                    | T.D. @ 19' below grade in Damp, plastic silty clay  |                         |                              | T.D. @ 19.0' in silty clay   |



## MONITORING WELL CONSTRUCTION INFORMATION

JOB. NO. C5018700BORING/WELL NO. 47WW26DATE 12-2-00CHIEF UNIT Wilcox1. PROTECTIVE CASING YES NOLOCKING YES NO

2. TYPE OF SURFACE SEAL (IF INSTALLED)

bentonite3. SOLID PIPE TYPE 304 S.S.SOLID PIPE LENGTH 9 ft.JOINT TYPE SLIP/GLUED/THREADED4. TYPE OF BACKFILL Cement/bentonite

HOW INSTALLED - TREMIE

FROM SURFACE

5. TYPE OF LOWER SEAL (IF INSTALLED)

bentonite chip

6. TYPE OF SECONDARY FILTER PACK

NA7. SCREEN TYPE 304 S.S.SCREEN LENGTH 10 ft.SLOT SIZE #10 Wire Wound in.SCREEN DIAMETER 4" I.D. in.

8. TYPE OF PRIMARY FILTER PACK

20-40 Silica Sand

9. TYPE OF BACKFILL

10. DRILLING METHOD HSA

WATER LEVEL \_\_\_\_\_ DATE \_\_\_\_\_

\*ALL DEPTHS MEASURED FROM GROUND SURFACE

| DRILLING LOG   |                    | DIVISION<br>USACE - Tulsa |   | INSTALLATION<br>LHAAP - Kurnock, TX                                    |                              | SHEET<br>1 OF 2 SHEETS  |  |
|--|--------------------|---------------------------|---|--|------------------------------|---|--|
| 1. PROJECT<br>LHAAP Supplemental RI Site 47  |                    |                           |   | 10. SIZE AND TYPE OF BIT<br>Auger Bits                                 |                              |   |  |
| 2. LOCATION (Coordinates or Station)   |                    |                           |   | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)                             |                              |   |  |
| 3. DRILLING AGENCY<br>ETTL - Tyler, TX   |                    |                           |   | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>Mobile B-51/5 Cont. Sampler |                              |   |  |
| 4. HOLE NO. (As shown on drawing title and file number)<br>47WW27  |                    |                           |   | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN<br>4                        |                              | DISTURBED<br>0  |  |
| 5. NAME OF DRILLER<br>Tom Cook   |                    |                           |   | 14. TOTAL NUMBER CORE BOXES<br>N/A                                     |                              | 15. ELEVATION GROUND WATER  |  |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |                    |                           |   | 16. DATE HOLE<br>STARTED 11-30-00                                      |                              | COMPLETED 11-30-00  |  |
| 7. THICKNESS OF OVERBURDEN<br>Penetrated 19.0'   |                    |                           |   | 17. ELEVATION TOP OF HOLE  |                              |   |  |
| 8. DEPTH DRILLED INTO ROCK<br>N/A  |                    |                           |   | 18. TOTAL CORE RECOVERY FOR BORING<br>N/A %                            |                              |   |  |
| 9. TOTAL DEPTH OF HOLE<br>19.0' below grade  |                    |                           |   | 19. SIGNATURE OF INSPECTOR<br>[Signature] PG                           |                              |   |  |
| ELEVATION<br>a   | DEPTH<br>(ft)<br>b | USC<br>LEGEND<br>c        | CLASSIFICATION OF MATERIALS<br>(Description)<br>d   | % CORE<br>RECOV-<br>ERY<br>e   | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |  |
|  | 1                  | CL                        | 3" of gravelly top soil with<br>grass roots over  |  | SS                           | 1420 Commenced HSA  |  |
|  | 2                  |                           | Silty clay Lt. to med.<br>brown, Lt. gray, tan, and<br>orange-brown mottled,<br>streaked, and stained,<br>some fine sand throughout,<br>plastic - Moist (St.H)  | 3.2'   | #1                           | Pilot hole $\approx 4\frac{1}{4}$ " I.D.  |  |
|  | 3                  |                           |   | 5.0'   | to                           | HNU colib. to isobutyl.<br>(10.2 eV Lamp)   |  |
|  | 4                  |                           |   |  | 4.0                          | HNU Reading in Sampler:<br>Oppn   |  |
|  | 5                  |                           |   |  |                              | HNU Reading @ Auger:<br>Oppn  |  |
|  | 6                  |                           | Silty Clay - Lt. brown, Lt.<br>gray, and tan with some<br>dark orange-brown and<br>dark rust colored inclusions<br>and staining throughout<br>sample, plastic, trace to<br>some fine sand throughout -<br>Moist (U. St.H) | 5.0'   | SS                           | Ambient air = Oppn  |  |
|  | 7                  |                           |   | 5.0'   | #2                           | HNU Reading in Sampler:<br>Oppn   |  |
|  | 8                  |                           |   |  | 4.0'                         | HNU Reading @ Auger:<br>Oppn  |  |
|  | 9                  |                           |   |  | 9.0'                         | Ambient air = Oppn  |  |
|  | 10                 |                           | Silty Clay - Lt. gray,<br>tan, and orange-brown<br>mottled, silt and sand<br>content inc. slightly $\approx$<br>depth, plastic - Moist<br>(St.H)  | 5.0'   | SS                           | HNU Reading in Sampler:<br>Oppn   |  |
|  | 11                 |                           |   | 5.0'   | #3                           | HNU Reading @ Auger:<br>Oppn  |  |
|  | 12                 |                           |   |  | 9.0'                         |   |  |
|  | 13                 |                           |   |  | to                           | Ambient Air = Oppn  |  |
|  | 14                 | SM                        | Silty Sand - Lt. orange-<br>brown and gray - mottled,<br>V. fine to fine grained  |  | SS                           | Water in augers @ 14.0'<br>From SM material   |  |
|  | 15                 | SP                        | Sand, poorly sorted - wet/<br>Saturated (Loose)   | 5.0'   | #4                           | HNU Reading in<br>Sampler:<br>2ppm  |  |
|  | 16                 |                           | Sand - Lt. gray and tan, V. fine<br>to fine grained, some silt,<br>poorly sorted - wet/saturated<br>(Loose) Gravel in silty sand<br>@ 17.0'   | 5.0'   | 14.0'                        | HNU Reading @<br>Augers = 0ppm  |  |
|  | 17                 | SM                        |   |  | to                           |   |  |
|  | 18                 |                           | Silty clay - Lt. to med.<br>gray and tan - mottled,<br>trace to some fine sand,<br>plastic - Damp (U. St.H)   |  | 19.0'                        | Ambient Air = 0ppm  |  |
|  | 19                 | CL                        |   |  |                              |   |  |
|  |                    |                           | T.D. @ 19.0' in silty clay  |  |                              |   |  |

| DRILLING LOG (Cont Sheet)         |            |             | ELEVATION TOP OF HOLE                             |                         | Hole No. 47WU27                 |   |
|-----------------------------------|------------|-------------|---|-------------------------|---------------------------------|---|
| PROJECT L HAAP Supplemental RI 47 |            |             | Site 47   |                         | INSTALLATION LHAAP - Karnack TX |   |
| SHEET 2                           |            |             | OF 2 SHEETS                                       |                         |                                 |   |
| ELEVATION<br>a                    | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f    | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g   |
|                                   |            |             |   |                         |                                 | <p>1520 Commenced<br/>overdrilling pilot<br/>hole with 11" O.D.<br/>HSA - "plugged" lead<br/>auger - for 4" SS<br/>monitor well<br/>installation</p> <p>-</p> <p>- Bent. seal 7' to 4'<br/>(20-40)</p> <p>- Filter-pack sand<br/>19' to 7'</p> <p>- 4" SS (304) #10 slot<br/>screen 19' - 9'</p> <p>T.D. @ 19.0' below<br/>grade in damp silty<br/>clay</p> |



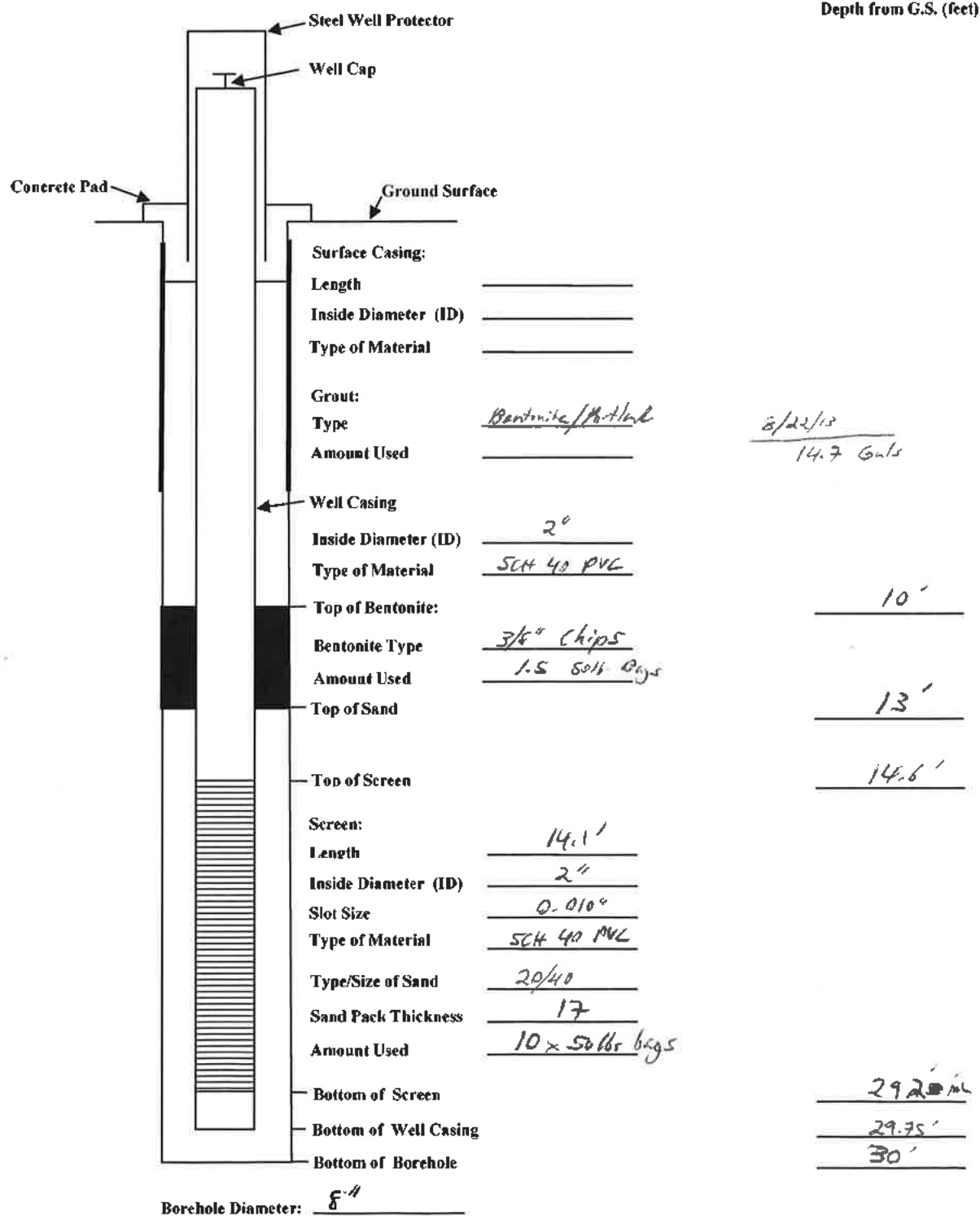
**AECOM**Client: USACEProject Number: 60251135Site Location: Site 50

Well Location:

Coords:

Method: HSA

WELL ID:

50WWAT 50WW08Date Installed: 8/22/13Borehole Diameter: 8"Contractor: TSS**MONITORING WELL CONSTRUCTION DETAIL**

Comments:

Installation Observed By:

M. Law

STATE OF TEXAS WELL REPORT for Tracking #345178

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW08         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 40" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 24" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 30 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 10 ft with Grout (#sacks and material)  
3rd Interval: From 10 ft to 13 ft with Bentonite (#sacks and material)  
Method Used: Gravity  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Slab Installed

Surface Completion:

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236

Driller License Number: 54611




|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Please include the report's Tracking number (Tracking #345178) on your written request.

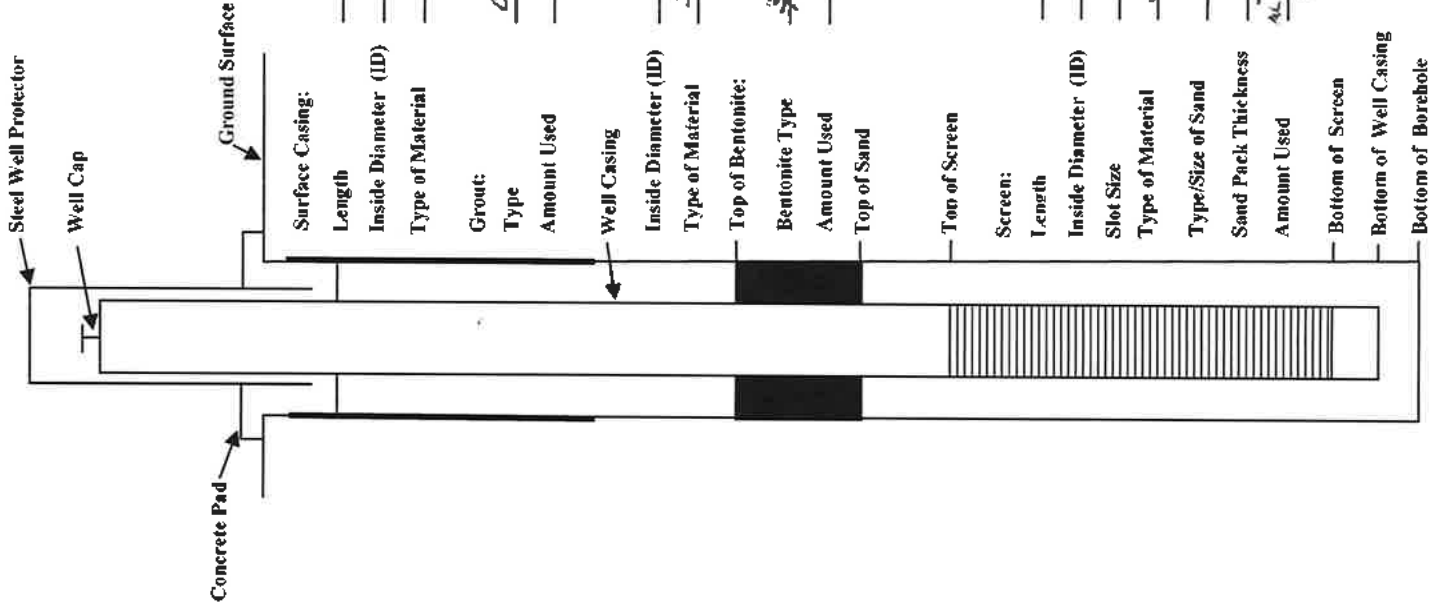
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                         | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|-------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description     | Dia. New/Used                         | Type Setting From/To           |
| 0 to 6.5                            | Yellow Brown Silty Clay | 2 New                                 | PVC Riser 0/15 Sched. 40       |
| 6.5 to 8                            | Tan Silty Sand          | 2 New                                 | PVC Screen 15/30 0.010 Slotted |
| 8 to 14.5                           | Tan and Gray Silty Clay |                                       |                                |
| 14.5 to 30                          | Tan and Gray Silty Sand |                                       |                                |

|              |                                 |   |
|--------------|---------------------------------|---|
| <b>AECOM</b> | Client: <u>USACE</u>            | WELL ID: <u><del>60256135</del> 50WVW09</u> |
|              | Project Number: <u>60256135</u> |   |
|              | Site Location: <u>Sta 50</u>    | Date Installed: <u>8/22/12</u>              |
|              | Well Location: _____            | Borehole Diameter: <u>8"</u>                |
|              | Method: <u>HSA</u>              | Contractor: <u>TSS</u>                      |

### MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Borehole Diameter: 8"

Comments: 1 to 1.5' Cave-in in borehole around screen.

Installation Observed By: M. Law

## STATE OF TEXAS WELL REPORT for Tracking #345179

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW09         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 40" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 24" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013

Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 60 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data:

1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)

2nd Interval: From 2 ft to 40 ft with Grout (#sacks and material)

3rd Interval: From 40 ft to 43 ft with Bentonite (#sacks and material)

Method Used: Gravity

Cemented By: Crew

Distance to Septic Field or other Concentrated Contamination: No Data

Distance to Property Line: No Data

Method of Verification: No Data

Approved by Variance: No Data

Surface Slab Installed

Surface Completion:

Water Level:

Static level: No Data

Artesian flow: No Data

Packers:

No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data

Depth of Strata: No Data

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

TotalSupport Services

4647 Brass Way

Dallas , TX 75236

Driller License Number:


54611

|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

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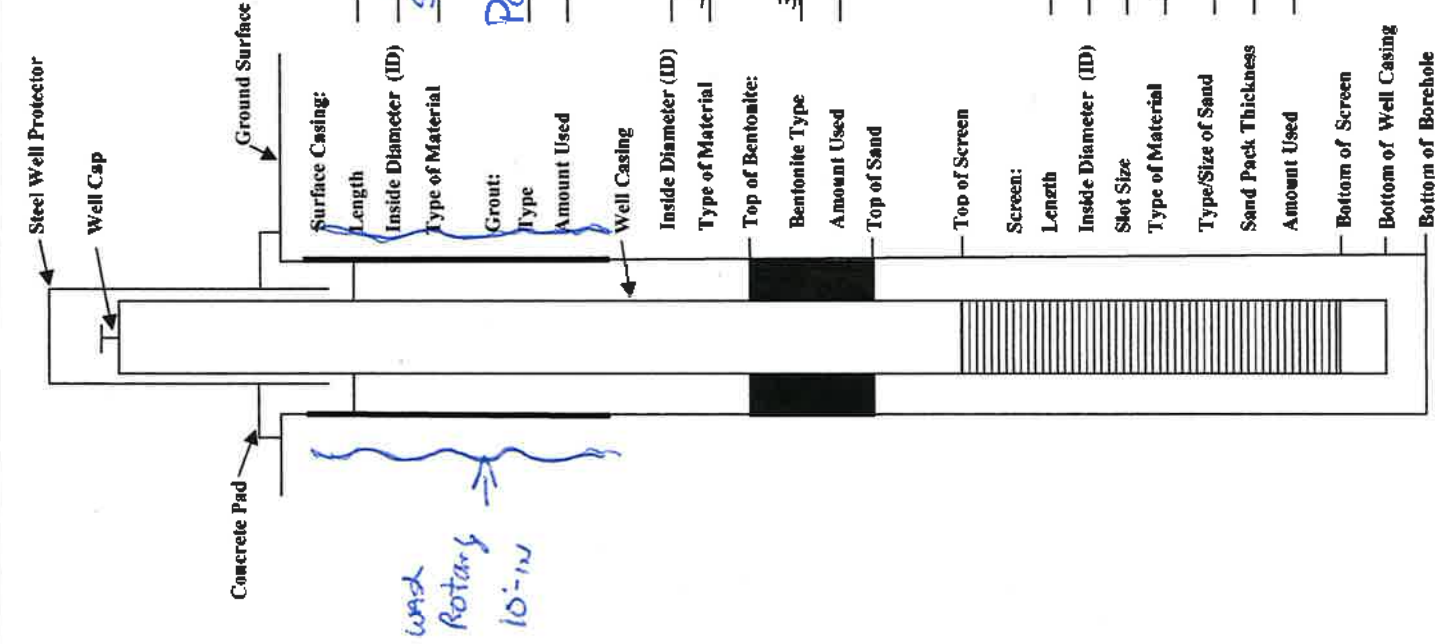
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                         | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|-------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description     | Dia. New/Used                         | Type Setting From/To           |
| 0 to 6.5                            | Yellow Brown Silty Clay | 2 New                                 | PVC Riser 0/45 Sched. 40       |
| 6.5 to 8                            | Tan Silty Sand          | 2 New                                 | PVC Screen 45/60 0.010 Slotted |
| 8 to 14.5                           | Tan and Gray Silty Clay |                                       |                                |
| 14.5 to 30                          | Tan and Gray Silty Sand |                                       |                                |
| 30 to 60                            | Gray Fine Sand          |                                       |                                |

50WW10

|               |   |   |
|---------------|---|---|
| <b>A-1COM</b> | Client: <u>USACE</u>                          | WELL ID: <u>50WW10-A3</u>                           |
|               | Project Number: <u>60256135</u>               | Date Installed: <u>8/20/13</u>                      |
|               | Site Location: <u>Site 50</u>                 | Borehole Diameter: <u>10" to 8.25" / 5.5" / 11"</u> |
|               | Well Location: <u>Method: HSA/Wash Rotary</u> | Contractor: <u>TSS</u>                              |
|               | Coords:                                       |   |

## MONITORING WELL CONSTRUCTION DETAIL

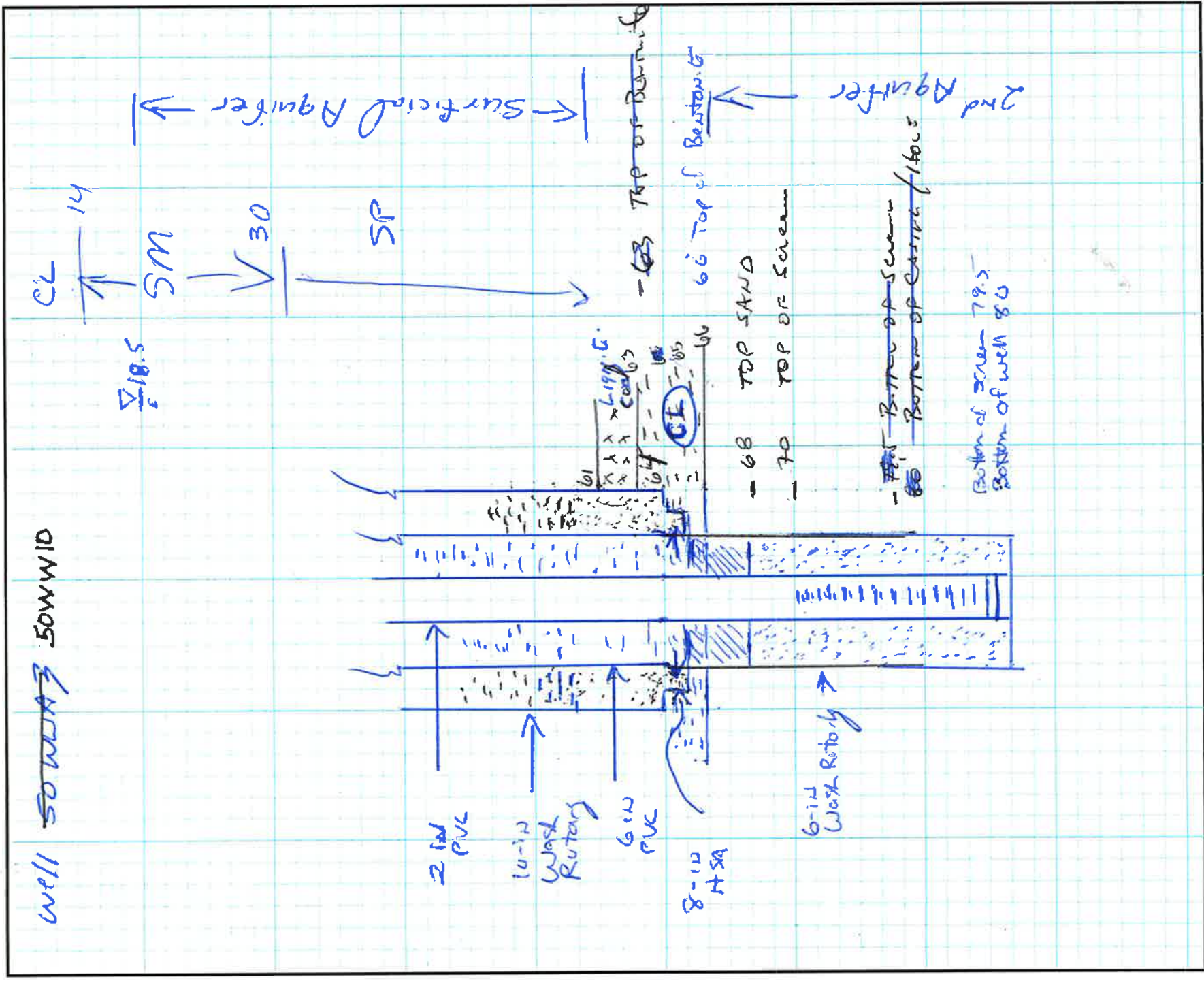


Borehole Diameter: 10" to 64'  
8.25" to 65.5'  
5.5" to 11"

Comments: Centralizer @ 50', 96', & 110'

Installation Observed By: M. Hartford  
M. L. L.

00954073





## STATE OF TEXAS WELL REPORT for Tracking #345187

Owner: USACE  
Address: Hwy 43  
Karnack , TX 75670  
Well Location: Hwy 43  
Karnack , TX 75670  
Well County: Harrison  
Elevation: No Data

Owner Well #: 50WW10  
Grid #: 35-23-6  
Latitude: 32° 40' 40" N  
Longitude: 094° 08' 24" W  
GPS Brand Used: No Data

Type of Work: New Well  
Proposed Use: Monitor

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 10 in From Surface To 64 ft  
Diameter: 6 in From 64 ft To 112 ft

Drilling Method: Mud Rotary

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 92 ft with Grout (#sacks and material)  
3rd Interval: From 92 ft to 97 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236

Driller License 54611

Number:

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**

Apprentice Registration Number: **No Data**

Comments: **No Data**

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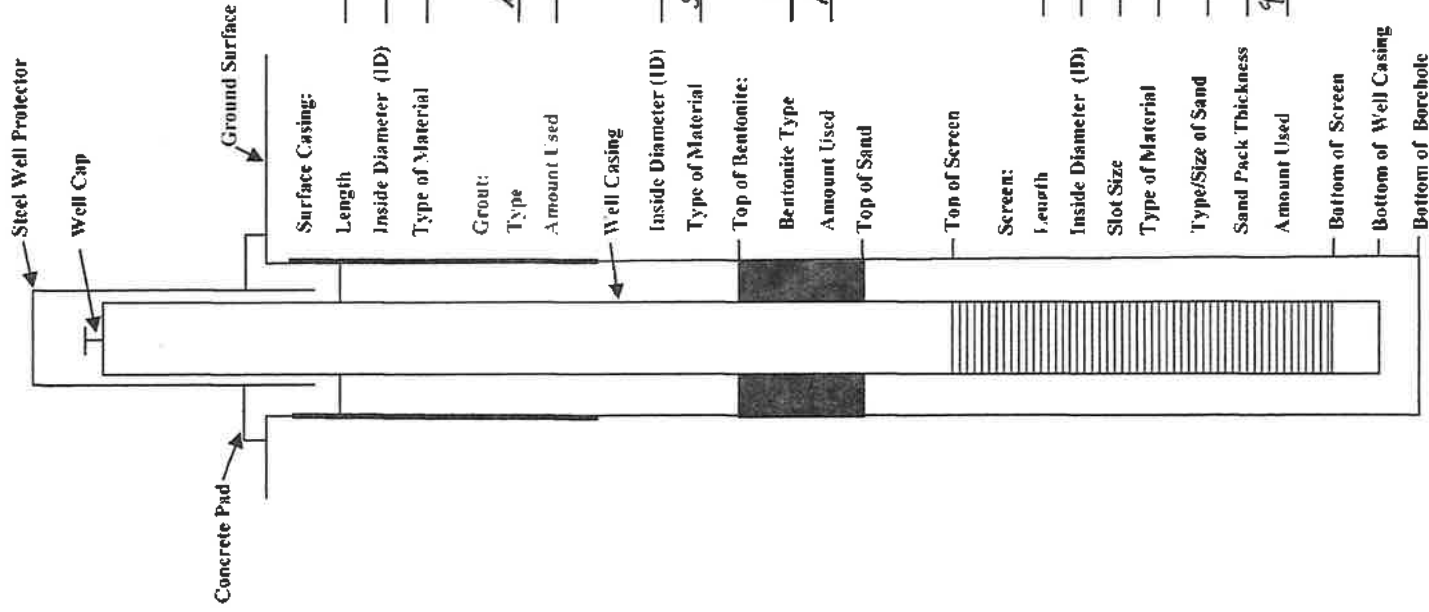
| DESC. & COLOR OF FORMATION MATERIAL | CASING, BLANK PIPE & WELL SCREEN DATA |      |                                     |
|-------------------------------------|---------------------------------------|------|-------------------------------------|
| From (ft) To (ft)                   | Description                           | Dia. | New/Used Type Setting From/To       |
| 0 to 6.5                            | Yellow Brown Silty Clay               | 6    | New PVC Casing 0/64 Sched. 40       |
| 6.5 to 8                            | Tan Silty Sand                        | 2    | New PVC Riser 0/99 Sched. 40        |
| 8 to 14.5                           | Tan and Gray Silty Clay               | 2    | New PVC Screen 99/109 0.010 Slotted |
| 14.5 to 30                          | Tan and Gray Silty Sand               |      |                                     |
| 30 to 60                            | Gray Fine Sand                        |      |                                     |
| 60 to 63                            | Lignite                               |      |                                     |
| 63 to 70                            | Brown Clay                            |      |                                     |
| 70 to 72                            | Lignite                               |      |                                     |
| 72 to 76                            | Gray Silty Clay                       |      |                                     |
| 76 to 85                            | Lignite                               |      |                                     |
| 85 to 92                            | Gray Sandy Clay                       |      |                                     |
| 92 to 100                           | Gray Clay                             |      |                                     |
| 100 to 110                          | Gray Sand                             |      |                                     |
| 110 to 112                          | Gray Clay                             |      |                                     |



|                |                                 |                                |
|----------------|---------------------------------|--------------------------------|
| <b>A-1-COM</b> | Client: <u>USACE</u>            | WELL ID: <u>50WVW11</u>        |
|                | Project Number: <u>60256135</u> |                                |
|                | Site Location: <u>516 50</u>    | Date Installed: <u>8/26/13</u> |
|                | Well Location:                  | Borehole Diameter: <u>8"</u>   |
|                | Method: <u>HSA</u>              | Contractor: <u>TSS</u>         |

### MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Borehole Diameter: 8"

Comments:

Installation Observed By:

M. Law

## STATE OF TEXAS WELL REPORT for Tracking #345193

Owner: USACE Owner Well #: 50WW11  
Address: Hwy 43 Grid #: 35-23-6  
Karnack , TX 75670  
Well Location: Hwy 43 Latitude: 32° 40' 41" N  
Karnack , TX 75670  
Well County: Harrison Longitude: 094° 08' 22" W  
Elevation: No Data GPS Brand Used: No Data

Type of Work: New Well Proposed Use: Monitor

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)  
3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236

Driller License Number: 54611

00954078

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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Austin, TX 78711  
(512) 463-7880 

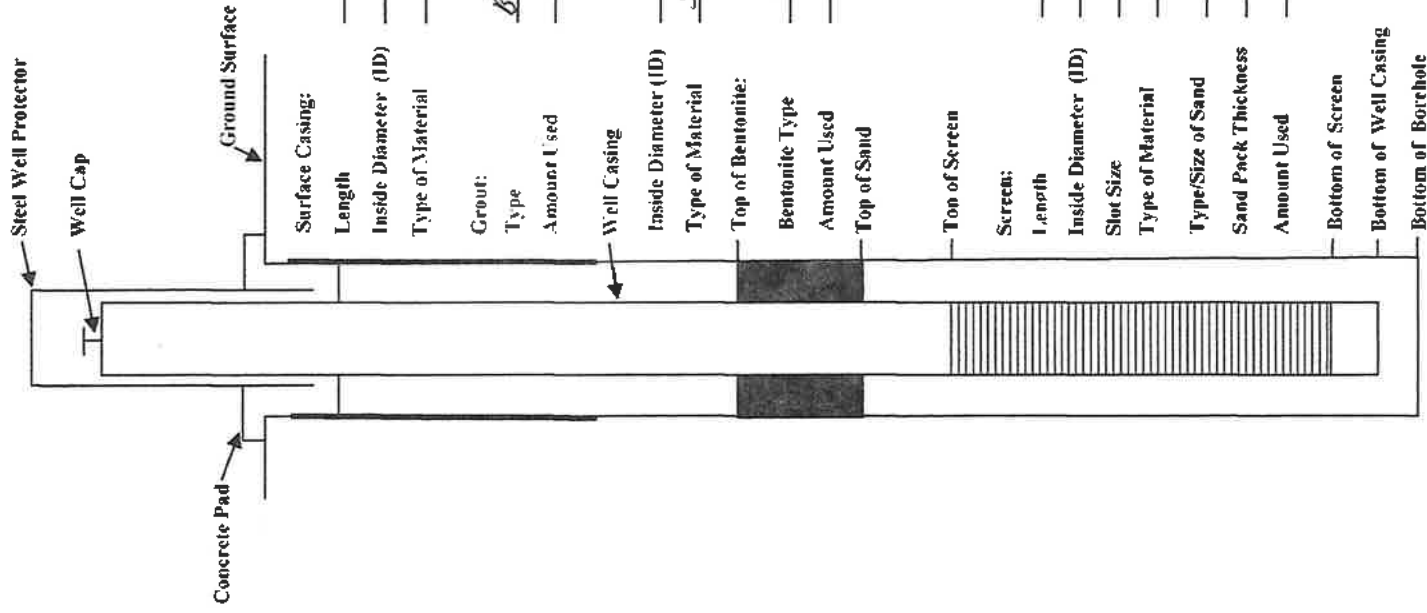
| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 1                              | Brown Silt                | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 1 to 9                              | Brown Gray Red Silty Clay | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 9 to 10                             | Gray Silt                 |                                       |                                |
| 10 to 35                            | Brown Silty Sand          |                                       |                                |

50WVW12

|               |                                 |  |                                |
|---------------|---------------------------------|--|--------------------------------|
| <b>A-2COM</b> | Client: <u>USAF</u>             |  | WELL ID: <u>50WVW12</u>        |
|               | Project Number: <u>60256135</u> |  |                                |
|               | Site Location: <u>Site 50</u>   |  | Date Installed: <u>8/25/12</u> |
|               | Well Location: _____            |  | Borehole Diameter: <u>8"</u>   |
|               | Method: <u>HSA</u>              |  | Contractor: <u>TSS</u>         |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Law

## STATE OF TEXAS WELL REPORT for Tracking #345195

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW12         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 42" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 20" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)  
3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236


Driller License Number: 54611

|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

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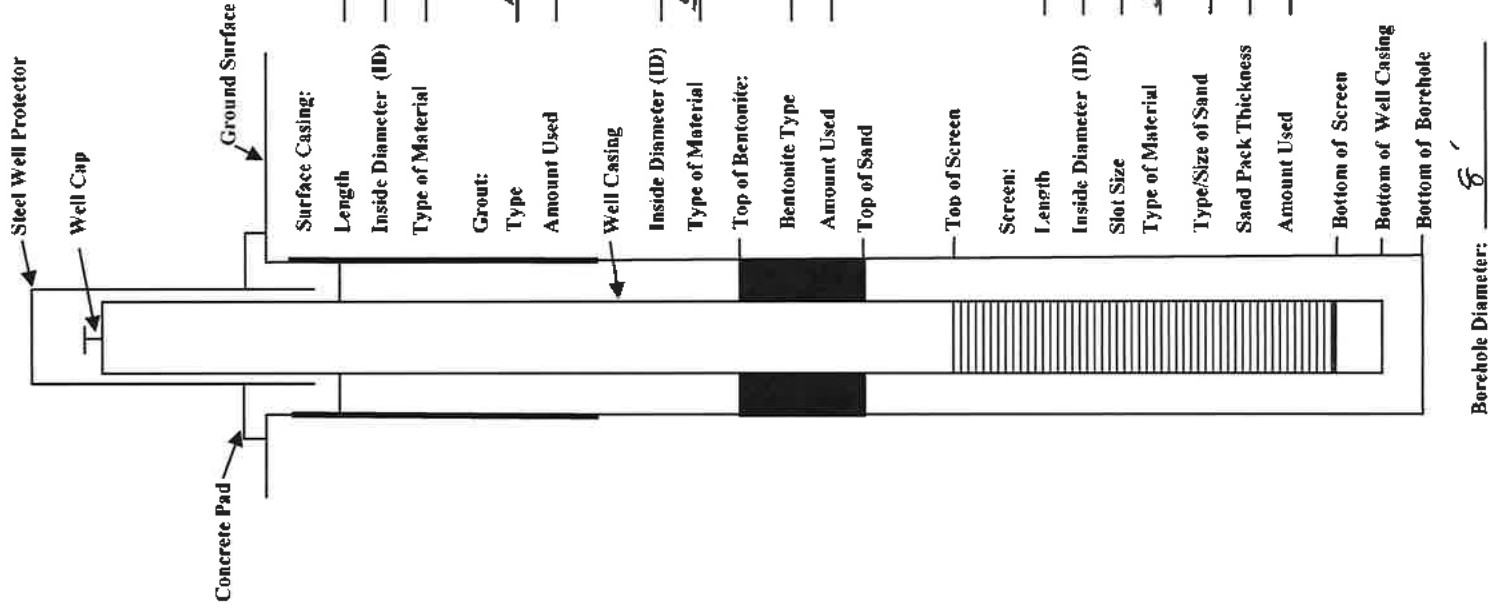
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P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 1                              | Brown Silt                | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 1 to 9                              | Brown Gray Red Silty Clay | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 9 to 10                             | Gray Silt                 |                                       |                                |
| 10 to 35                            | Brown Silty Sand          |                                       |                                |

|              |                                 |                                 |
|--------------|---------------------------------|---------------------------------|
| <b>AECOM</b> | Client: <u>USACE</u>            | WELL ID: <u>SWW00-DT-SWVW13</u> |
|              | Project Number: <u>60256135</u> | Date Installed: <u>8/28/13</u>  |
|              | Site Location: <u>Site 50</u>   | Borehole Diameter: <u>8"</u>    |
|              | Well Location: _____            | Contractor: <u>TSS</u>          |
|              | Method: <u>HSA</u>              |                                 |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By:

M. Law

## STATE OF TEXAS WELL REPORT for Tracking #345198

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW13         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 41" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 22" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013

Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data:

1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)

2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)

3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)

Method Used: Tremmie

Cemented By: Crew

Distance to Septic Field or other Concentrated Contamination: No Data

Distance to Property Line: No Data

Method of Verification: No Data

Approved by Variance: No Data

Surface Slab Installed

Surface Completion:

Water Level:

Static level: No Data

Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data

Depth of Strata: No Data

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

TotalSupport Services

4647 Brass Way

Dallas , TX 75236

Driller License Number:

54611



Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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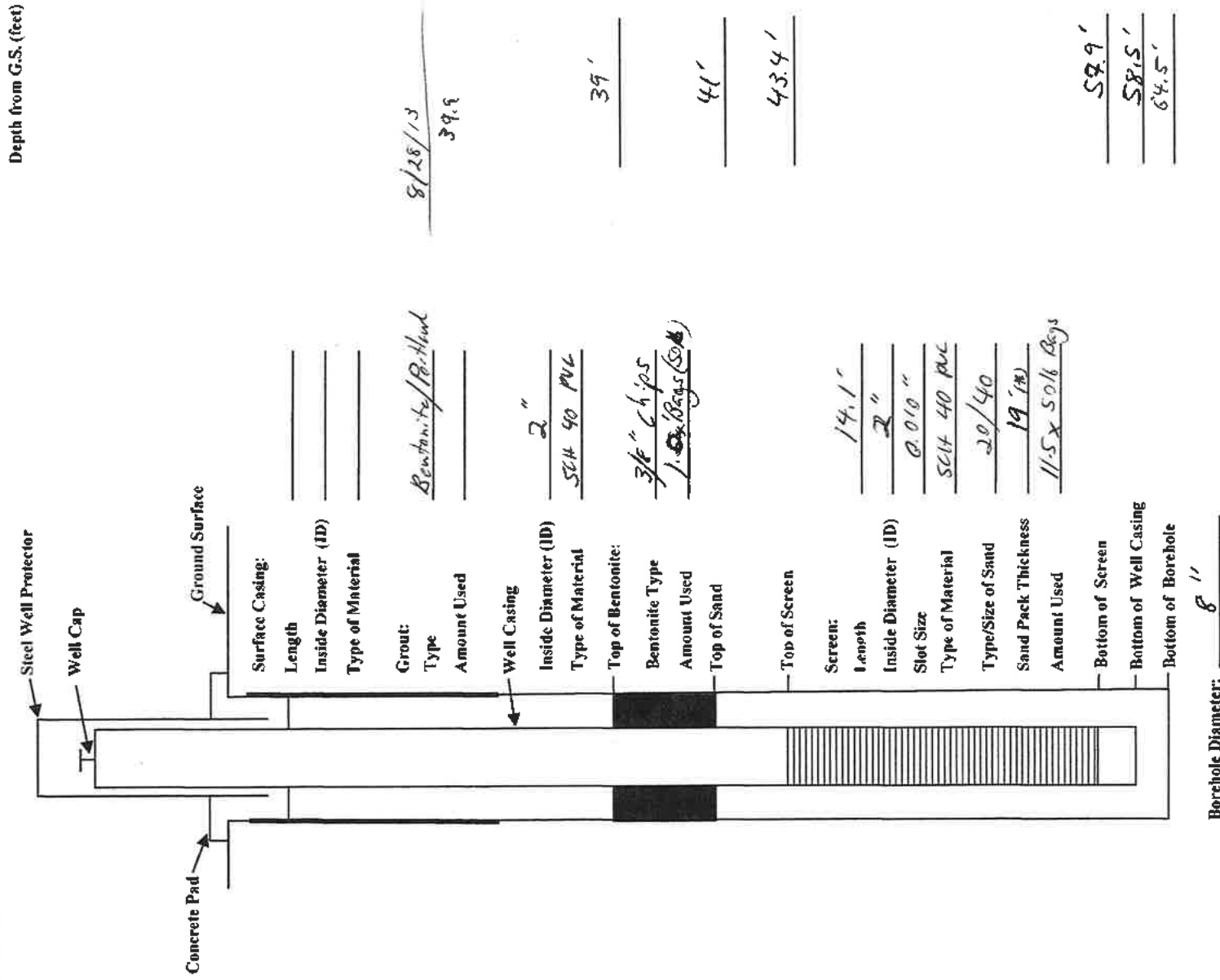
Please include the report's Tracking number (Tracking #345198) on your written request.

**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 2                              | Brown Silty Sand          | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 2 to 9                              | Brown Gray Red Silty Clay | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 9 to 10                             | Red Brown Clayey Sand     |                                       |                                |
| 10 to 35                            | Brown Silty Sand          |                                       |                                |

|              |                 |          |                    |               |
|--------------|-----------------|----------|--------------------|---------------|
| <b>A=COM</b> | Client:         | USACE    | WELL ID:           | 504072250WW14 |
|              | Project Number: | 60256135 | Date Installed:    | 8/23/13       |
|              | Site Location:  | S-7c 50  | Borehole Diameter: | 8"            |
|              | Well Location:  |          | Contractor:        | TSS           |
|              | Method:         | HSA      |                    |               |

## MONITORING WELL CONSTRUCTION DETAIL



Comments: (\*) Best fill Breddle w/ Bentonite pellets to 60' gys.

Installation Observed By: *M. Law*

**STATE OF TEXAS WELL REPORT for Tracking #345200**

Owner: **USACE** Owner Well #: **50WW14**  
Address: **Hwy 43** Grid #: **35-23-6**  
**Karnack , TX 75670**  
Well Location: **Hyw 43** Latitude: **32° 40' 41" N**  
**Karnack , TX 75670** Longitude: **094° 08' 22" W**  
Well County: **Harrison**  
Elevation: **No Data** GPS Brand Used: **No Data**

Type of Work: **New Well** Proposed Use: **Monitor**

Drilling Date: Started: **8/8/2013**  
Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 60 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data: 1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**  
2nd Interval: **From 2 ft to 39 ft with Grout (#sacks and material)**  
3rd Interval: **From 39 ft to 41 ft with Bentonite (#sacks and material)**  
Method Used: **Tremmie**  
Cemented By: **Crew**  
Distance to Septic Field or other Concentrated Contamination: **No Data**  
Distance to Property Line: **No Data**  
Method of Verification: **No Data**  
Approved by Variance: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**  
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**  
Depth of Strata: **No Data**  
Chemical Analysis Made: **No Data**  
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **TotalSupport Services**  
**4647 Brass Way**  
**Dallas , TX 75236**

Driller License Number: **54611**

00954087

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Please include the report's Tracking number (Tracking #345200) on your written request.

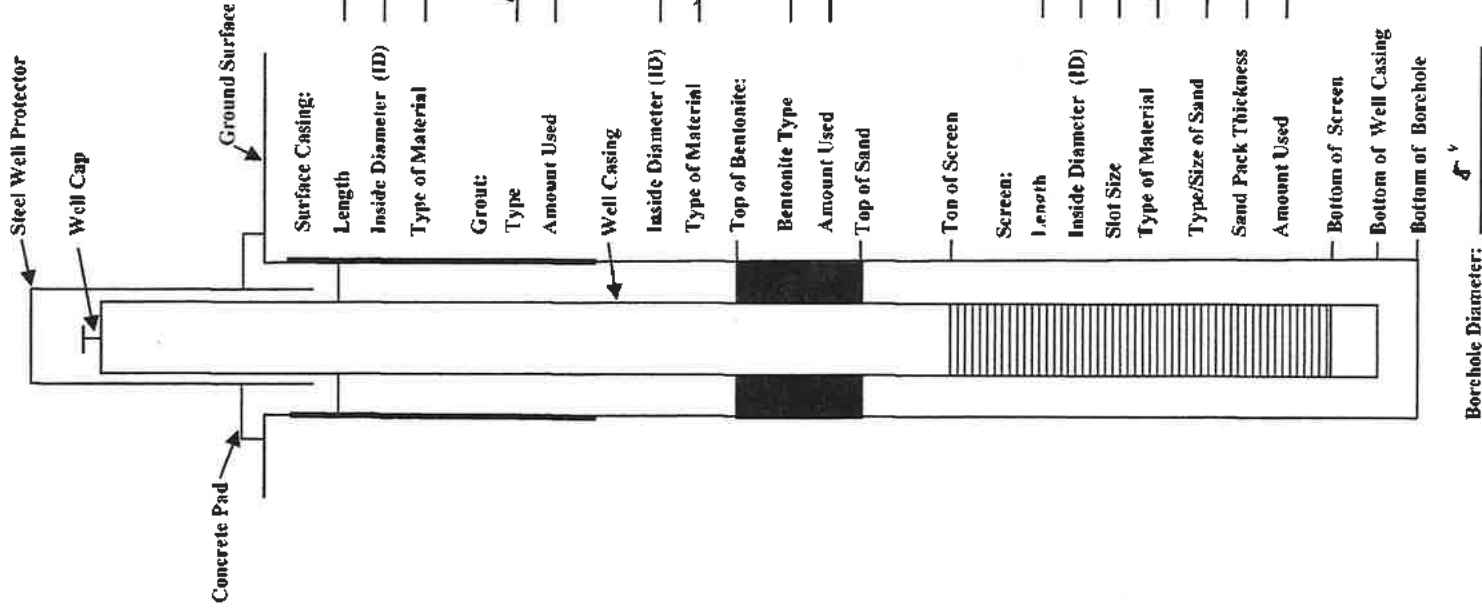
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 2                              | Brown Silty Sand          | 2 New                                 | PVC Riser 0/43 Sched. 40       |
| 2 to 9                              | Brown Gray Red Silty Clay | 2 New                                 | PVC Screen 43/58 0.010 Slotted |
| 9 to 10                             | Red Brown Clayey Sand     |                                       |                                |
| 10 to 60                            | Brown Silty Sand          |                                       |                                |

|              |                                 |  |                               |
|--------------|---------------------------------|--|-------------------------------|
| <b>AZCOM</b> | Client: <u>USACE</u>            |  | WELL ID: <u>50WW15</u>        |
|              | Project Number: <u>60256135</u> |  | <del>50WW15</del>             |
|              | Site Location: <u>Sta 50</u>    |  | Date Installed: <u>9/9/13</u> |
|              | Well Location: _____            |  | Borehole Diameter: <u>8"</u>  |
|              | Method: <u>HSA</u>              |  | Contractor: <u>TSS</u>        |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By:

M. L. L. L.

## STATE OF TEXAS WELL REPORT for Tracking #345202

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW15         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 41" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 24" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)  
3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236


Driller License Number: 54611

|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

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Please include the report's Tracking number (Tracking #345202) on your written request.

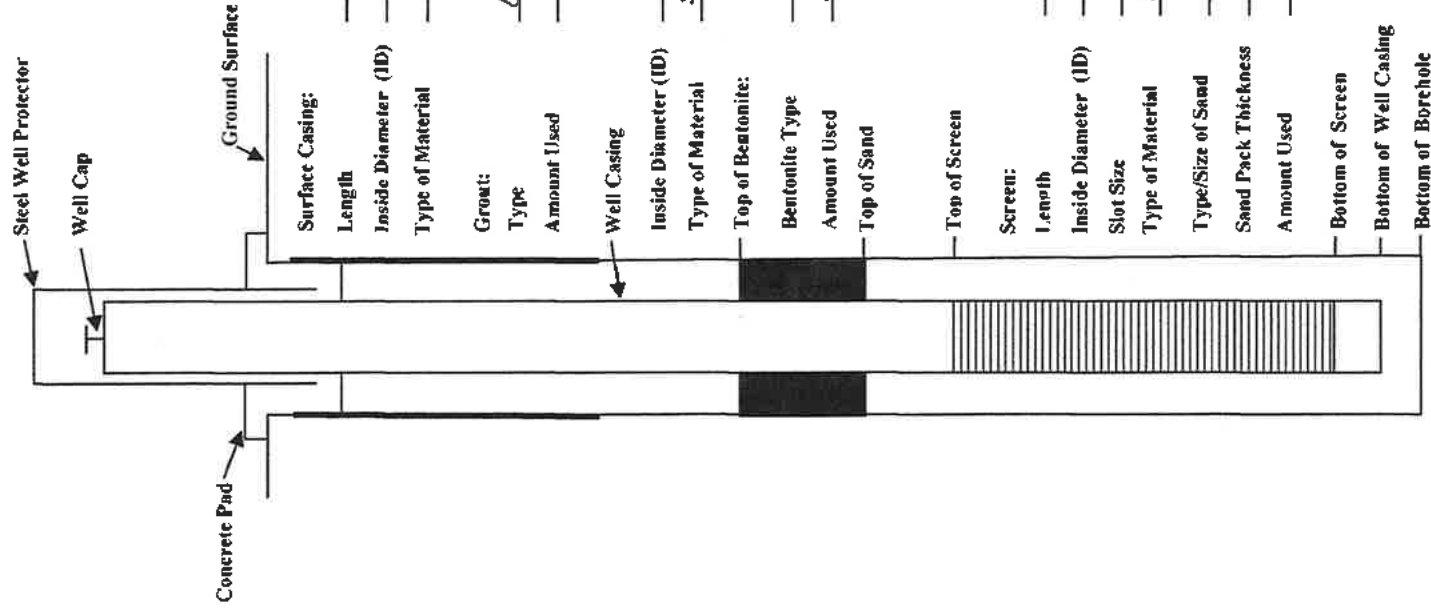
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                    |
|-------------------------------------|---------------------------|---------------------------------------|------------------------------------|
| From (ft) To (ft)                   | Description               | Dia.                                  | New/Used Type Setting From/To      |
| 0 to 5                              | Brown Silty Sand          | 2                                     | New PVC Riser 0/20 Sched. 40       |
| 5 to 14                             | Brown Gray Red Silty Clay | 2                                     | New PVC Screen 20/35 0.010 Slotted |
| 14 to 35                            | Brown Silty Sand          |                                       |                                    |

|                     |                                 |                                |
|---------------------|---------------------------------|--------------------------------|
| <b>A-<u>COM</u></b> | Client: <u>USACE</u>            | WELL ID: <u>50WV16</u>         |
|                     | Project Number: <u>60256135</u> |                                |
|                     | Site Location: <u>Site 50</u>   | Date Installed: <u>9/10/13</u> |
|                     | Well Location: _____            | Borehole Diameter: <u>8"</u>   |
|                     | Method: <u>HSA</u>              | Contractor: <u>TSS</u>         |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments:

Installation Observed By:

M. Law



## STATE OF TEXAS WELL REPORT for Tracking #345203

Owner: USACE  
Address: Hwy 43  
Karnack , TX 75670  
Well Location: Hwy 43  
Karnack , TX 75670  
Well County: Harrison  
Elevation: No Data

Owner Well #: 50WW16  
Grid #: 35-23-6  
Latitude: 32° 40' 43" N  
Longitude: 094° 08' 22" W  
GPS Brand Used: No Data

Type of Work: New Well  
Proposed Use: Monitor

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)  
3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236

Driller License Number: 54611

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Please include the report's Tracking number (Tracking #345203) on your written request.

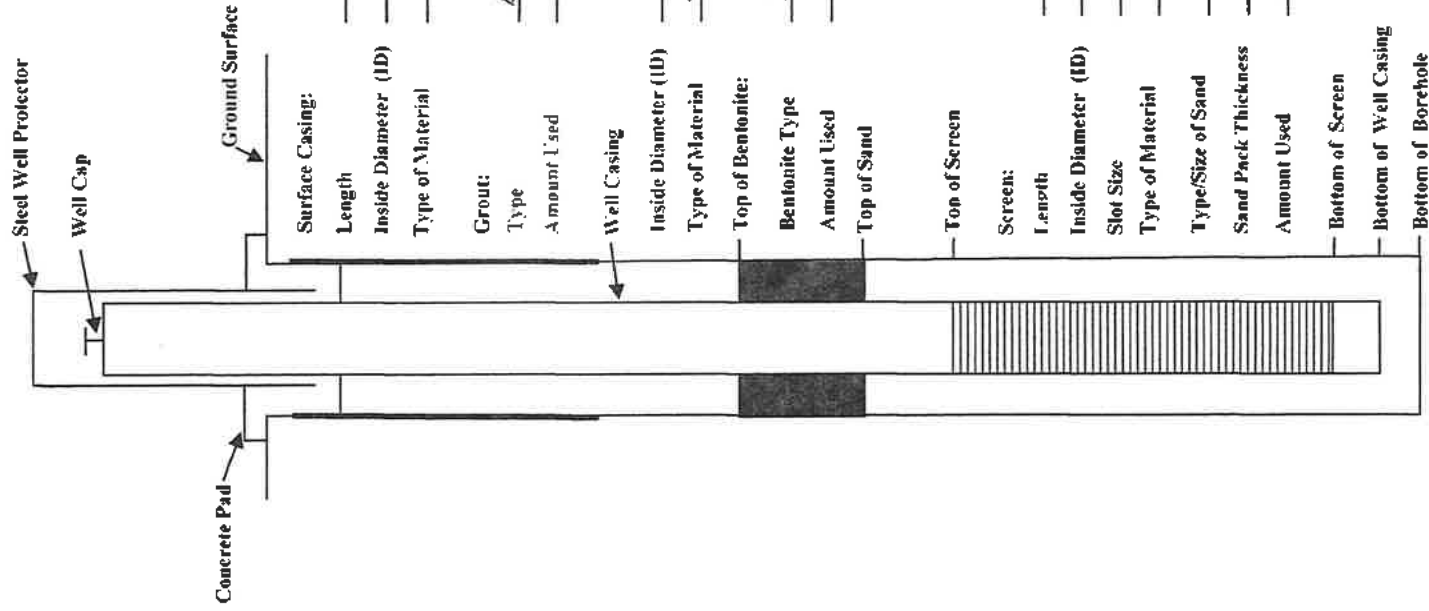
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 4.5                            | Brown Silty Sand          | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 4.5 to 5                            | Brown Gray Red Silty Clay | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 5 to 10                             | Tan Silty Sand            |                                       |                                |
| 10 to 35                            | Brown Silty Sand          |                                       |                                |

|                     |                                 |  |                               |
|---------------------|---------------------------------|--|-------------------------------|
| <b>A-<u>COM</u></b> | Client: <u>USACE</u>            |  | WELL ID: <u>50WWT6 50WWT7</u> |
|                     | Project Number: <u>60256135</u> |  |                               |
|                     | Site Location: <u>Site 5D</u>   |  | Date Installed: <u>9/6/13</u> |
|                     | Well Location: _____            |  | Borehole Diameter: <u>8"</u>  |
|                     | Method: <u>HSA</u>              |  | Contractor: <u>TSS</u>        |

### MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By:

M. Law

## STATE OF TEXAS WELL REPORT for Tracking #345208

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW17         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 44" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 16" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013

Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 65 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data:

1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)

2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)

3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)

Method Used: Tremmie

Cemented By: Crew

Distance to Septic Field or other Concentrated Contamination: No Data

Distance to Property Line: No Data

Method of Verification: No Data

Approved by Variance: No Data

Surface Slab Installed

Surface Completion:

Water Level:

Static level: No Data

Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data

Depth of Strata: No Data

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

TotalSupport Services

4647 Brass Way

Dallas , TX 75236

Driller License Number:

54611

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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Please include the report's Tracking number (Tracking #345208) on your written request.

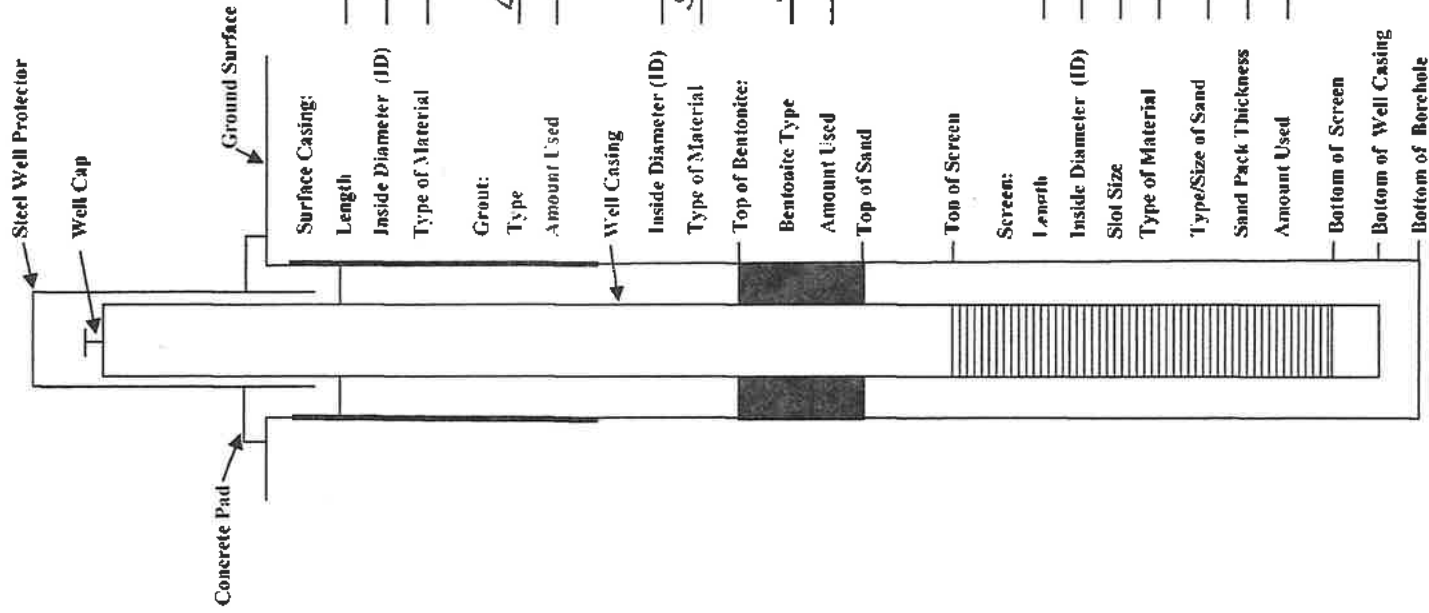
Texas Department of Licensing & Regulation  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |         |                           | CASING, BLANK PIPE & WELL SCREEN DATA |          |                                |                 |
|-------------------------------------|---------|---------------------------|---------------------------------------|----------|--------------------------------|-----------------|
| From (ft)                           | To (ft) | Description               | Dia.                                  | New/Used | Type                           | Setting From/To |
| 0                                   | to 5    | Brown Gray Red Silty Clay | 2                                     | New      | PVC Riser 0/20 Sched. 40       |                 |
| 5                                   | to 8.5  | Tan Silty Sand            | 2                                     | New      | PVC Screen 20/65 0.010 Slotted |                 |
| 8.5                                 | to 12   | Brown Silty Sandy Clay    |                                       |          |                                |                 |
| 12                                  | to 22   | Gray Silty Clay           |                                       |          |                                |                 |
| 22                                  | to 24   | Gray Silt                 |                                       |          |                                |                 |
| 24                                  | to 65   | Gray Silty Sand           |                                       |          |                                |                 |

|                |                                |                               |
|----------------|--------------------------------|-------------------------------|
| <b>A-2-COM</b> | Client: <u>USACE</u>           | WELL ID: <u>50007750WW1B</u>  |
|                | Project Number: <u>0256135</u> |                               |
|                | Site Location: <u>Site 50</u>  | Date Installed: <u>9/2/13</u> |
|                | Well Location:                 | Borehole Diameter: <u>8"</u>  |
|                | Method: <u>HSA</u>             | Contractor: <u>TSS</u>        |

### MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By:

M. Law

34.6'

35.2'

35.2'

9/7/13

23.1 Gals

Bentonite/Richard

2"

SCH 40 PVC

15'

18'

20.1'

3/8" Chips

1.5 x 50lb bag

14.1

2"

0.010"

SCH 40 PVC

20/40

17.2

10 x 50lb bags

## STATE OF TEXAS WELL REPORT for Tracking #345211

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW18         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 44" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 17" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

Type of Work: New Well

Proposed Use: Monitor

Drilling Date:

Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole:

Diameter: 8 in From Surface To 35 ft

Drilling Method:

Hollow Stem Auger

Borehole

Other: 20/40 Silica Sand

Completion:

Annular Seal Data:

1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 15 ft with Grout (#sacks and material)  
3rd Interval: From 15 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface

Surface Slab Installed

Completion:

Water Level:

Static level: No Data  
Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company  
Information:

TotalSupport Services  
4647 Brass Way  
Dallas , TX 75236

Driller License  
Number:

54611

00954099

D-33

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Please include the report's Tracking number (Tracking #345211) on your written request.

**Texas Department of Licensing & Regulation**  
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Austin, TX 78711  
(512) 463-7880 

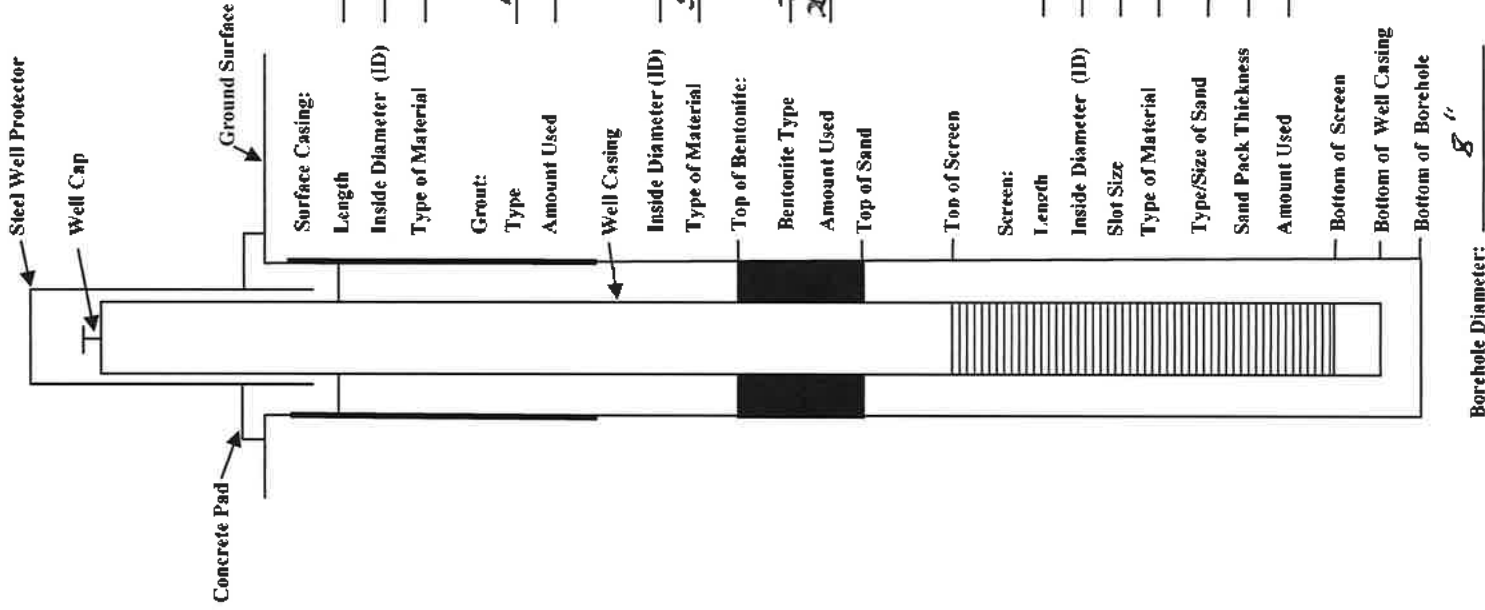
| DESC. & COLOR OF FORMATION MATERIAL |                       | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|-----------------------|---------------------------------------|--------------------------------|
| From (ft) To (ft)                   | Description           | Dia. New/Used                         | Type Setting From/To           |
| 0 to 9                              | Brown Silty           | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 9 to 18                             | Gray Sandy Silty Clay | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 18 to 35                            | Gray Silty Sand       |                                       |                                |



|              |                                 |                               |
|--------------|---------------------------------|-------------------------------|
| <b>AECOM</b> | Client: <u>CSACE</u>            | WELL ID: <u>50WW19</u>        |
|              | Project Number: <u>60256135</u> | Date Installed: <u>9/5/13</u> |
|              | Site Location: <u>SHC 50</u>    | Borehole Diameter: <u>8"</u>  |
|              | Well Location: _____            | Contractor: <u>TSS</u>        |
|              | Method: <u>HSA</u>              |                               |

### MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments: \_\_\_\_\_

Installation Observed By: M. Law

**STATE OF TEXAS WELL REPORT for Tracking #345219**

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW19         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 43" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 15" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: **8/8/2013**  
Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 65 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data: 1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**  
2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)**  
3rd Interval: **From 15 ft to 17 ft with Bentonite (#sacks and material)**  
Method Used: **Tremmie**  
Cemented By: **Crew**  
Distance to Septic Field or other Concentrated Contamination: **No Data**  
Distance to Property Line: **No Data**  
Method of Verification: **No Data**  
Approved by Variance: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**  
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**  
Depth of Strata: **No Data**  
Chemical Analysis Made: **No Data**  
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **TotalSupport Services**  
**4647 Brass Way**  
**Dallas , TX 75236**

Driller License Number: **54611**

00954102

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                          | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|--------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description      | Dia. New/Used                         | Type Setting From/To           |
| 0 to 4.5                            | Brown Silty Clay         | 2 New                                 | PVC Riser 0/19 Sched. 40       |
| 4.5 to 9                            | Brown Silty Sand         | 2 New                                 | PVC Screen 19/64 0.010 Slotted |
| 9 to 22                             | Gray Silty Clay          |                                       |                                |
| 22 to 27                            | Brown Silty Sand         |                                       |                                |
| 27 to 28                            | Greenish Gray Silty Clay |                                       |                                |
| 28 to 65                            | Gray Silty Sand          |                                       |                                |

|              |                                 |                                  |
|--------------|---------------------------------|----------------------------------|
| <b>AZCOM</b> | Client: <u>USACE</u>            | WELL ID: <u>50WJ1, 50WJ20</u>    |
|              | Project Number: <u>60256135</u> | Date Installed: <u>8/13/13</u>   |
|              | Site Location: <u>SITE 50</u>   | Borehole Diameter: <u>8'1/4"</u> |
|              | Well Location: <u>50WJ1</u>     | Coords:                          |
|              | Method: <u>HSA</u>              | Contractor: <u>TSS</u>           |

## MONITORING WELL CONSTRUCTION DETAIL

|                                     |   |              |
|-------------------------------------|---|--------------|
|                                     | Depth from G.S. (feet)                  |              |
|                                     | Surface Casing: Length <u>NA</u>        |              |
|                                     | Inside Diameter (ID) <u>NA</u>          |              |
|                                     | Type of Material <u>NA</u>              |              |
|                                     | Grout: Type <u>NA</u>                   |              |
|                                     | Amount Used <u>NA</u>                   |              |
|                                     | Well Casing <u>2"</u>                   |              |
|                                     | Inside Diameter (ID) <u>SCH. 40 PVC</u> | <u>12.9'</u> |
|                                     | Type of Material <u>CHIPS</u>           |              |
|                                     | Top of Bentonite: <u>1.1 ft³</u>        | <u>15.9'</u> |
|                                     | Bentonite Type <u>CHIPS</u>             |              |
|                                     | Amount Used <u>1.1 ft³</u>              | <u>18.3'</u> |
|                                     | Top of Sand                             |              |
|                                     | Top of Screen <u>34.5'</u>              |              |
|                                     | Screen: Length <u>2'</u>                |              |
| Inside Diameter (ID) <u>0.01"</u>   |   |              |
| Slot Size <u>SCH. 40 PVC</u>        |   |              |
| Type of Material <u>20/40</u>       |   |              |
| Type/Size of Sand <u>32.4</u>       |   |              |
| Sand Pack Thickness <u>13.2 ft³</u> | <u>52.8'</u>                            |              |
| Amount Used                         | <u>53.3'</u>                            |              |
| Bottom of Screen                    | <u>60.0'</u>                            |              |
| Bottom of Well Casing               |   |              |
| Bottom of Borehole                  |   |              |
| Borehole Diameter: <u>8'1/4"</u>    |   |              |

Comments:

BOTTOM OF BOREHOLE WAS BACKFILLED  
W/ BENTONITE TO 54' AND TO 53.3' W/ SAND

Installation Observed By:

G. Horton

**STATE OF TEXAS WELL REPORT for Tracking #345222**

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW20         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hyw 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 39" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 18" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: **8/8/2013**  
Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 60 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data: 1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**  
2nd Interval: **From 2 ft to 12 ft with Grout (#sacks and material)**  
3rd Interval: **From 12 ft to 16 ft with Bentonite (#sacks and material)**  
Method Used: **Tremmie**  
Cemented By: **Crew**  
Distance to Septic Field or other Concentrated Contamination: **No Data**  
Distance to Property Line: **No Data**  
Method of Verification: **No Data**  
Approved by Variance: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**  
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**  
Depth of Strata: **No Data**  
Chemical Analysis Made: **No Data**  
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **TotalSupport Services**  
**4647 Brass Way**  
**Dallas , TX 75236**

Driller License Number: **54611**

00954105

D-39

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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Austin, TX 78711  
(512) 463-7880 

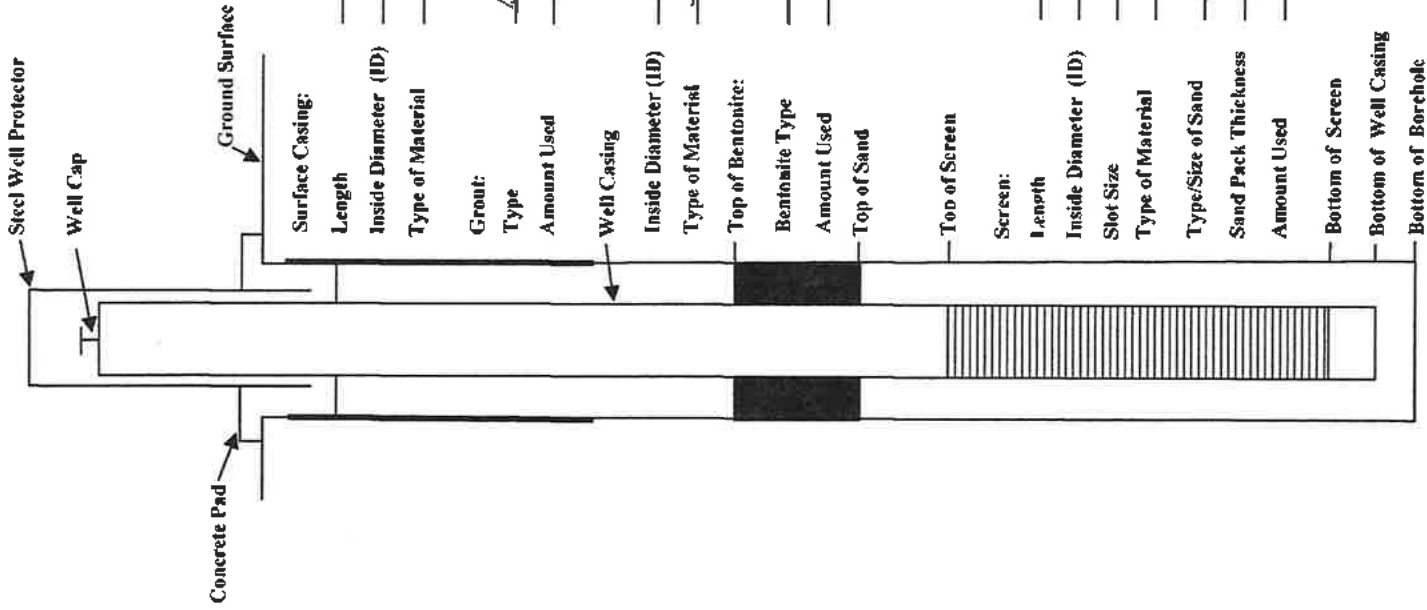
| DESC. & COLOR OF FORMATION MATERIAL |         | CASING, BLANK PIPE & WELL SCREEN DATA |               |                                |
|-------------------------------------|---------|---------------------------------------|---------------|--------------------------------|
| From (ft)                           | To (ft) | Description                           | Dia. New/Used | Type Setting From/To           |
| 0                                   | to 7    | Gray Red Brown Silty Clay             | 2 New         | PVC Riser 0/18 Sched. 40       |
| 7                                   | to 8    | Brown Silty Sand                      | 2 New         | PVC Screen 18/53 0.010 Slotted |
| 8                                   | to 15   | Gray Silty Clay                       |               |                                |
| 15                                  | to 17   | Brown Silty Sand                      |               |                                |
| 17                                  | to 19   | Brown Silty Clay                      |               |                                |
| 19                                  | to 51   | Red Brown Silty Sand                  |               |                                |
| 51                                  | to 53   | Lignite                               |               |                                |
| 53                                  | to 60   | Gray Silty Clay                       |               |                                |

00954106

|              |                                 |                                |
|--------------|---------------------------------|--------------------------------|
| <b>AZCOM</b> | Client: <u>USACE</u>            | WELL ID: <u>50256135</u>       |
|              | Project Number: <u>60256135</u> |                                |
|              | Site Location: <u>Site 50</u>   | Date Installed: <u>8/24/13</u> |
|              | Well Location: _____            | Borehole Diameter: <u>8"</u>   |
|              | Method: <u>HSA</u>              | Contractor: <u>TSS</u>         |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments: \_\_\_\_\_

Installation Observed By: M. Law

**STATE OF TEXAS WELL REPORT for Tracking #353070**

Owner: **USACE** Owner Well #: **50WW21**  
Address: **Hwy 43** Grid #: **35-23-6**  
**Karnack , TX 75670**  
Well Location: **Hwy 43** Latitude: **32° 40' 40" N**  
**Karnack , TX 75670** Longitude: **094° 08' 21" W**  
Well County: **Harrison** GPS Brand Used: **No Data**  
Elevation: **No Data**

Type of Work: **New Well** Proposed Use: **Monitor**

Drilling Date: Started: **8/8/2013**  
Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 35 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data: 1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**  
2nd Interval: **From 2 ft to 14.5 ft with Grout (#sacks and material)**  
3rd Interval: **From 14.5 ft to 18 ft with Bentonite (#sacks and material)**  
Method Used: **Tremmie**  
Cemented By: **Crew**  
Distance to Septic Field or other Concentrated Contamination: **No Data**  
Distance to Property Line: **No Data**  
Method of Verification: **No Data**  
Approved by Variance: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**  
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**  
Depth of Strata: **No Data**  
Chemical Analysis Made: **No Data**  
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **Total Support Services**  
**4647 Brass Way**  
**Dallas , TX 75236**

Driller License Number: **54611**

00954108




|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

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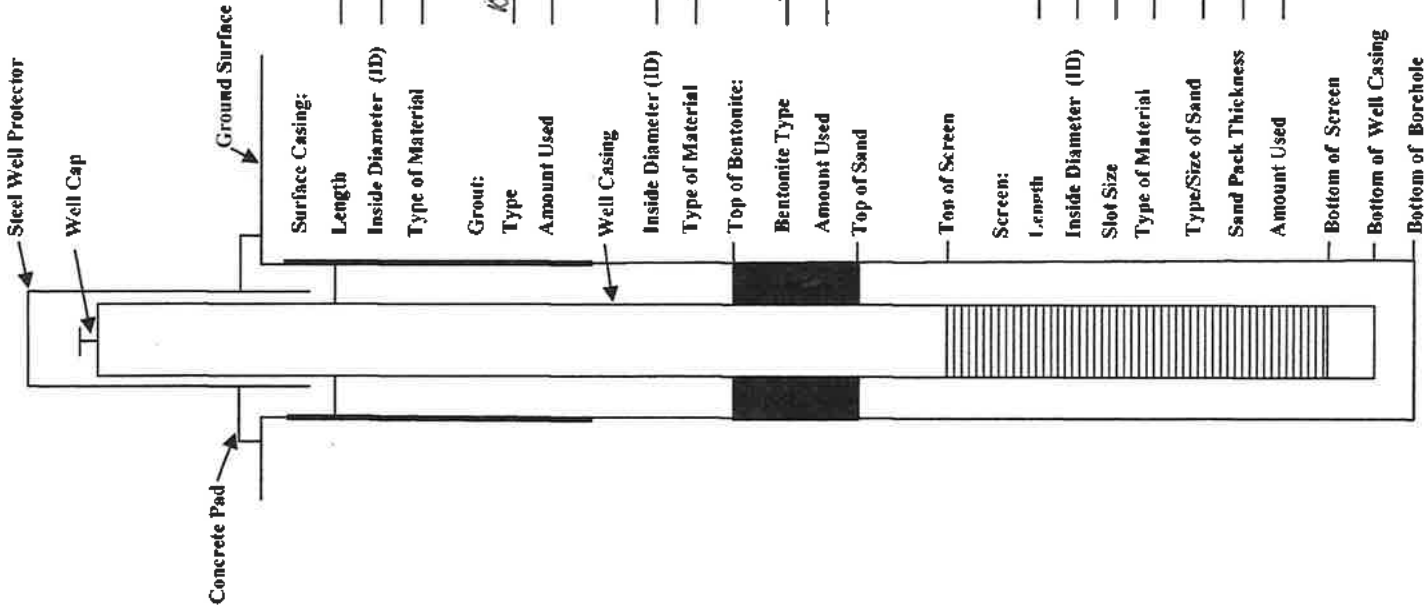
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 5                              | Gray Red Brown Silty Clay | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 5 to 9                              | Gray Sand                 | 2 New                                 | PVC Screen 20/35 0.010 Slotted |
| 9 to 10                             | Gray Sandy Clay           |                                       |                                |
| 10 to 35                            | Red Brown Silty Sand      |                                       |                                |

|              |                                 |                                |
|--------------|---------------------------------|--------------------------------|
| <b>AZCOM</b> | Client: <u>USACE</u>            | WELL ID: <u>50WW11</u>         |
|              | Project Number: <u>60256135</u> |                                |
|              | Site Location: <u>Sta 50</u>    | Date Installed: <u>8/23/13</u> |
|              | Well Location: _____            | Borehole Diameter: <u>8"</u>   |
|              | Method: <u>Hand</u>             | Contractor: <u>FSO</u>         |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments: \_\_\_\_\_

Installation Observed By: M. L. W.

## STATE OF TEXAS WELL REPORT for Tracking #353071

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW22         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hwy 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 40" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 24" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 35 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 16 ft with Grout (#sacks and material)  
3rd Interval: From 16 ft to 18 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: Total Support Services  
4647 Brass Way  
Dallas , TX 75236

Driller License Number: 54611

00954111

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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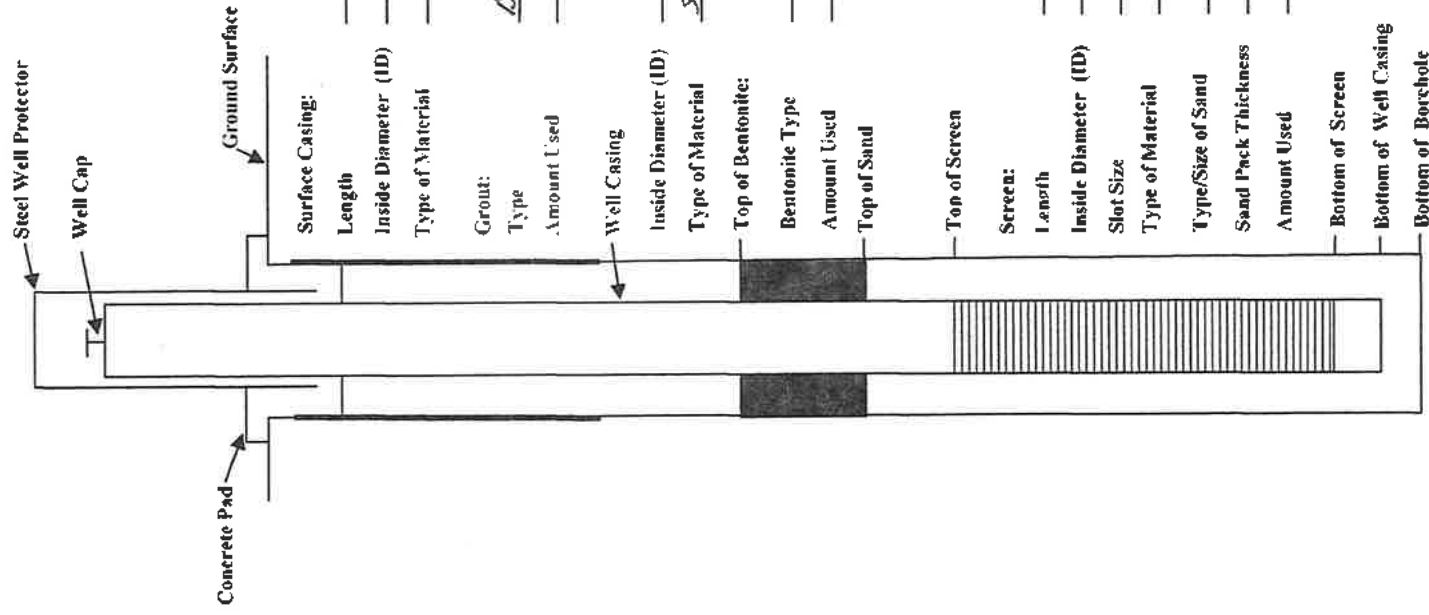
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description       | Dia. New/Used                         | Type Setting From/To           |
| 0 to 18                             | Gray Red Brown Silty Clay | 2 New                                 | PVC Riser 0/20 Sched. 40       |
| 18 to 35                            | Red Brown Silty Sand      | 2 New                                 | PVC Screen 20/35 0.010 Slotted |

|                |                                 |                                  |
|----------------|---------------------------------|----------------------------------|
| <b>A-1 COM</b> | Client: <u>USACE</u>            | WELL ID: <u>Saturated 50WV13</u> |
|                | Project Number: <u>60256135</u> | Date Installed: <u>8/25/13</u>   |
|                | Site Location: <u>S7c 50</u>    | Borehole Diameter: <u>8"</u>     |
|                | Well Location: _____            | Coords: _____                    |
|                | Method: <u>HSA</u>              | Contractor: <u>TSS</u>           |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By: M. Law

**STATE OF TEXAS WELL REPORT for Tracking #353072**

Owner: **USACE** Owner Well #: **50WW23**  
Address: **Hwy 43** Grid #: **35-23-6**  
**Karnack , TX 75670**  
Well Location: **Hwy 43** Latitude: **32° 40' 41" N**  
**Karnack , TX 75670** Longitude: **094° 08' 20" W**  
Well County: **Harrison**  
Elevation: **No Data** GPS Brand Used: **No Data**

Type of Work: **New Well** Proposed Use: **Monitor**

Drilling Date: Started: **8/8/2013**  
Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 35 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data: 1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**  
2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)**  
3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)**  
Method Used: **Tremmie**  
Cemented By: **Crew**  
Distance to Septic Field or other Concentrated Contamination: **No Data**  
Distance to Property Line: **No Data**  
Method of Verification: **No Data**  
Approved by Variance: **No Data**

Surface Completion: **Surface Slab Installed**

Water Level: Static level: **No Data**  
Artesian flow: **No Data**

Packers: **No Data**

Plugging Info: Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump: **No Data**

Well Tests: **No Data**

Water Quality: Type of Water: **No Data**  
Depth of Strata: **No Data**  
Chemical Analysis Made: **No Data**  
Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: **Total Support Services**  
**4647 Brass Way**  
**Dallas , TX 75236**

Driller License Number: **54611**

00954114

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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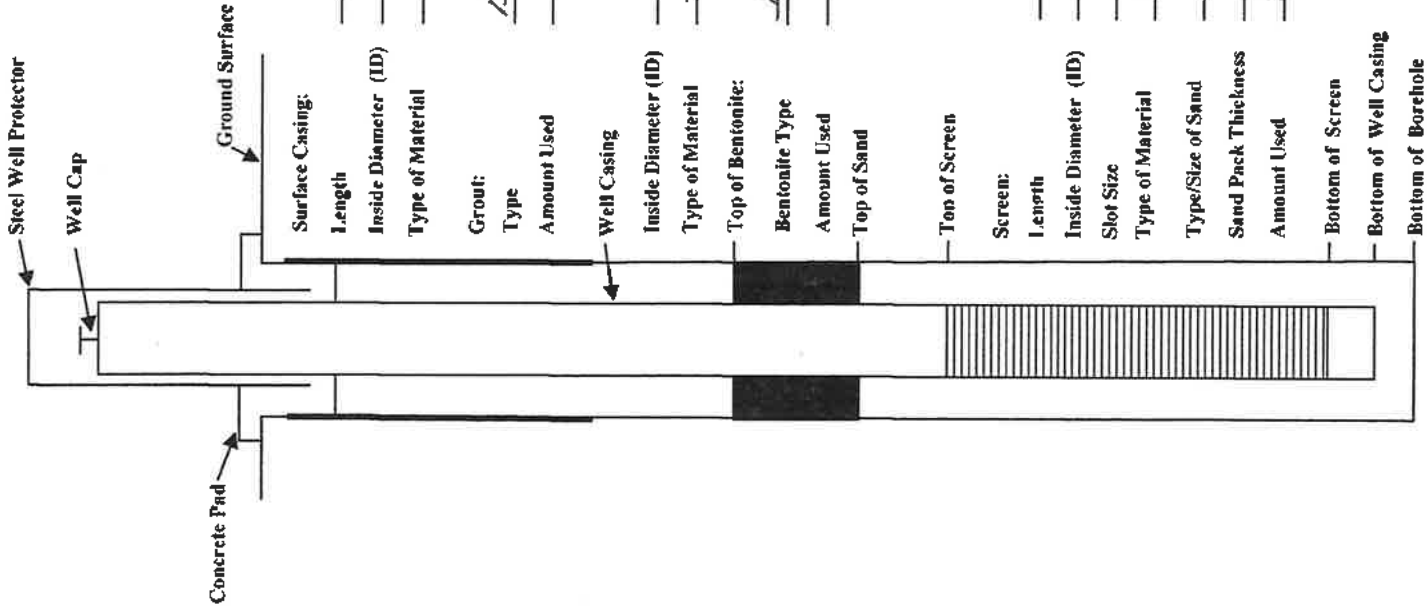
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                           | CASING, BLANK PIPE & WELL SCREEN DATA |       |                                |
|-------------------------------------|---------------------------|---------------------------------------|-------|--------------------------------|
| From (ft)                           | To (ft)                   | Description                           | Dia.  | New/Used Type Setting From/To  |
| 0 to 15                             | Gray Red Brown Silty Clay |                                       | 2 New | PVC Riser 0/20 Sched. 40       |
| 15 to 35                            | Red Brown Silty Sand      |                                       | 2 New | PVC Screen 20/35 0.010 Slotted |

|                |                                 |                                 |
|----------------|---------------------------------|---------------------------------|
| <b>A-2-COM</b> | Client: <u>USACE</u>            | WELL ID: <u>50-000-1-50WW24</u> |
|                | Project Number: <u>60258135</u> |                                 |
|                | Site Location: <u>Sta 50</u>    | Date Installed: <u>8/24/13</u>  |
|                | Well Location: _____            | Borehole Diameter: <u>8"</u>    |
|                | Method: <u>HSA</u>              | Contractor: <u>TSS</u>          |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments:

Installation Observed By:

M. Law



**STATE OF TEXAS WELL REPORT for Tracking #353073**

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW24         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hwy 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 41" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 18" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: **8/8/2013**

Completed: **9/18/2013**

Diameter of Hole: Diameter: **8 in From Surface To 35 ft**

Drilling Method: **Hollow Stem Auger**

Borehole Completion: Other: **20/40 Silica Sand**

Annular Seal Data:

1st Interval: **From 0 ft to 2 ft with Concrete (#sacks and material)**

2nd Interval: **From 2 ft to 15 ft with Grout (#sacks and material)**

3rd Interval: **From 15 ft to 18 ft with Bentonite (#sacks and material)**

Method Used: **Tremmie**

Cemented By: **Crew**

Distance to Septic Field or other Concentrated Contamination: **No Data**

Distance to Property Line: **No Data**

Method of Verification: **No Data**

Approved by Variance: **No Data**

**Surface Slab Installed**

Surface Completion:

Water Level:

Static level: **No Data**

Artesian flow: **No Data**

Packers:

**No Data**

Plugging Info:

Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump:

**No Data**

Well Tests:

**No Data**

Water Quality:

Type of Water: **No Data**

Depth of Strata: **No Data**

Chemical Analysis Made: **No Data**

Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

**Total Support Services**

**4647 Brass Way**

**Dallas , TX 75236**

Driller License Number:

**54611**

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #353073) on your written request.

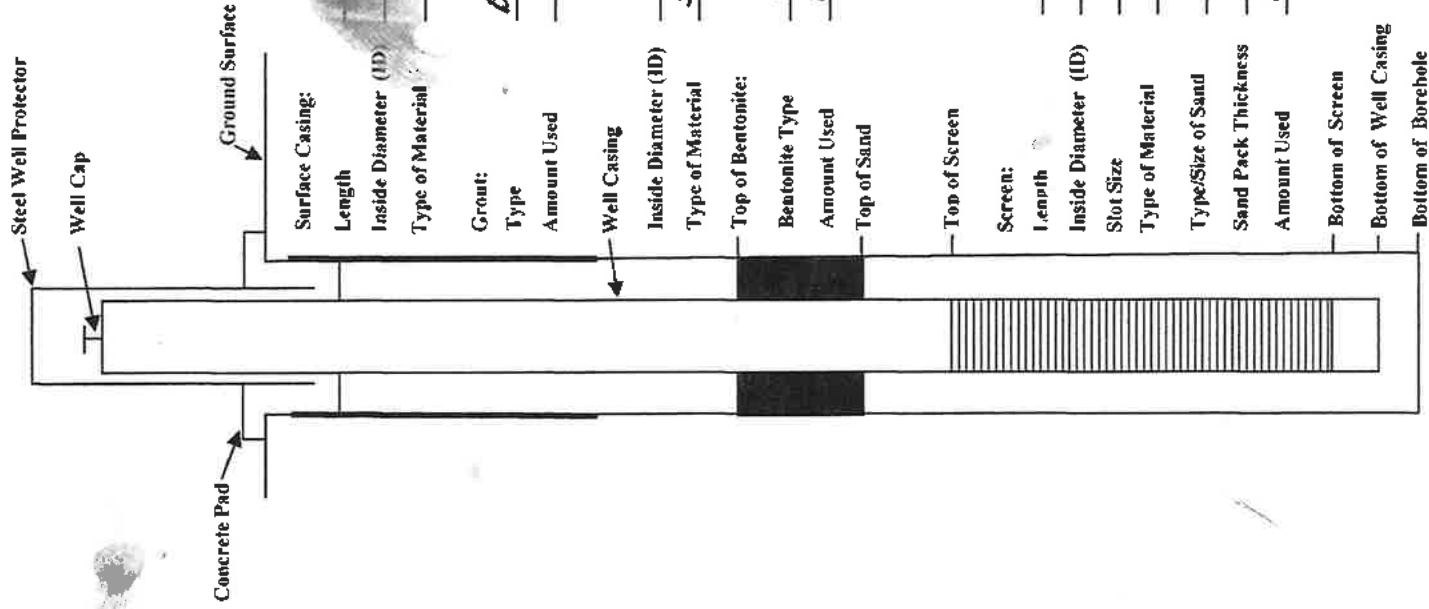
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |           | CASING, BLANK PIPE & WELL SCREEN DATA |      |          |            |                         |
|-------------------------------------|-----------|---------------------------------------|------|----------|------------|-------------------------|
| From (ft)                           | To (ft)   | Description                           | Dia. | New/Used | Type       | Setting From/To         |
| 0 to 15                             | Gray Red  | Brown Silty Clay                      | 2    | New      | PVC Riser  | 0/20.5 Sched. 40        |
| 15 to 35                            | Red Brown | Silty Sand                            | 2    | New      | PVC Screen | 20.5/35.5 0.010 Slotted |

|               |                                 |                                |
|---------------|---------------------------------|--------------------------------|
| <b>A-1COM</b> | Client: <u>USALES</u>           | WELL ID: <u>5000-50WW15</u>    |
|               | Project Number: <u>02250130</u> |                                |
|               | Site Location: <u>Site 50</u>   | Date Installed: <u>9/10/12</u> |
|               | Well Location: _____            | Borehole Diameter: <u>8"</u>   |
|               | Method: <u>HSA</u>              | Contractor: <u>TSS</u>         |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments:

Installation Observed By: M. Lcw

## STATE OF TEXAS WELL REPORT for Tracking #353075

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW25         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hwy 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 44" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 25" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013  
Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 55 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data: 1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)  
2nd Interval: From 2 ft to 37 ft with Grout (#sacks and material)  
3rd Interval: From 37 ft to 43 ft with Bentonite (#sacks and material)  
Method Used: Tremmie  
Cemented By: Crew  
Distance to Septic Field or other Concentrated Contamination: No Data  
Distance to Property Line: No Data  
Method of Verification: No Data  
Approved by Variance: No Data

Surface Completion: Surface Slab Installed

Water Level: Static level: No Data  
Artesian flow: No Data

Packers: No Data

Plugging Info: Casing or Cement/Bentonite left in well: No Data

Type Of Pump: No Data

Well Tests: No Data

Water Quality: Type of Water: No Data  
Depth of Strata: No Data  
Chemical Analysis Made: No Data  
Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information: Total Support Services  
4647 Brass Way  
Dallas , TX 75236

Driller License Number: 54611


00954120

|  |                   |
|--|-------------------|
| Licensed Well Driller Signature:         | <b>Brian Kern</b> |
| Registered Driller Apprentice Signature: | <b>No Data</b>    |
| Apprentice Registration Number:          | <b>No Data</b>    |
| Comments:                                | <b>No Data</b>    |

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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Please include the report's Tracking number (Tracking #353075) on your written request.

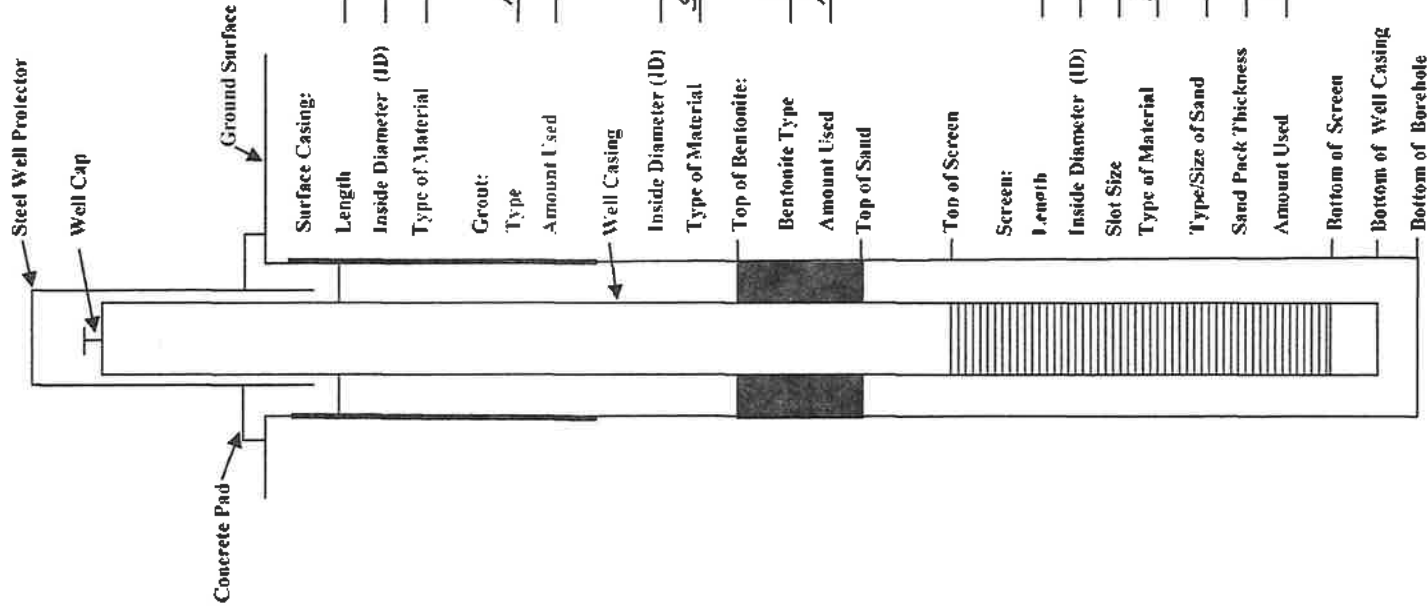
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |         | CASING, BLANK PIPE & WELL SCREEN DATA |      |                                    |
|-------------------------------------|---------|---------------------------------------|------|------------------------------------|
| From (ft)                           | To (ft) | Description                           | Dia. | New/Used Type Setting From/To      |
| 0                                   | to 17   | Gray Red Brown Silty Clay             | 2    | New PVC Riser 0/45 Sched. 40       |
| 17                                  | to 24   | Red Brown Silty Sand                  | 2    | New PVC Screen 45/55 0.010 Slotted |
| 24                                  | to 25   | Brown Sandy Clay                      |      |                                    |
| 25                                  | to 30   | Brown Silty Sand                      |      |                                    |
| 30                                  | to 35   | Brown Silty Sand And Clay             |      |                                    |
| 35                                  | to 46   | Brown Silty Sand                      |      |                                    |
| 46                                  | to 55   | Brown Silty Sand W/Clay Seams         |      |                                    |

|              |                                |                               |
|--------------|--------------------------------|-------------------------------|
| <b>AZCOM</b> | Client: <u>USACE</u>           | WELL ID: <u>50WWS-50WV26</u>  |
|              | Project Number: <u>6025615</u> | Date Installed: <u>9/5/13</u> |
|              | Site Location: <u>Sta 50</u>   | Borehole Diameter: <u>8"</u>  |
|              | Well Location: _____           | Coords: _____                 |
|              | Method: <u>HSA</u>             | Contractor: <u>TSS</u>        |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)

Borehole Diameter: 8"

Comments:

Installation Observed By:

M. Law

## STATE OF TEXAS WELL REPORT for Tracking #353079

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW26         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hwy 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 40" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 21" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

Type of Work: **New Well**Proposed Use: **Monitor**Drilling Date: **Started: 8/8/2013****Completed: 9/18/2013**Diameter of Hole: **Diameter: 8 in From Surface To 60 ft**Drilling Method: **Hollow Stem Auger**Borehole Completion: **Other: 20/40 Silica Sand**

Annular Seal Data:

**1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)****2nd Interval: From 2 ft to 40 ft with Grout (#sacks and material)****3rd Interval: From 40 ft to 43 ft with Bentonite (#sacks and material)**Method Used: **Tremmie**Cemented By: **Crew**Distance to Septic Field or other Concentrated Contamination: **No Data**Distance to Property Line: **No Data**Method of Verification: **No Data**Approved by Variance: **No Data**

Surface Completion:

**Surface Slab Installed**

Water Level:

Static level: **No Data**Artesian flow: **No Data**

Packers:

**No Data**

Plugging Info:

Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump:

**No Data**

Well Tests:

**No Data**

Water Quality:

Type of Water: **No Data**Depth of Strata: **No Data**Chemical Analysis Made: **No Data**Did the driller knowingly penetrate any strata which contained undesirable constituents: **No Data**

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

**Total Support Services****4647 Brass Way****Dallas , TX 75236**

Driller License Number:

**54611**

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

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**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |         | CASING, BLANK PIPE & WELL SCREEN DATA |      |                                    |
|-------------------------------------|---------|---------------------------------------|------|------------------------------------|
| From (ft)                           | To (ft) | Description                           | Dia. | New/Used Type Setting From/To      |
| 0                                   | to 10   | Gray Red Brown Silty Clay             | 2    | New PVC Riser 0/45 Sched. 40       |
| 10                                  | to 35   | Brown Silty Sand                      | 2    | New PVC Screen 45/60 0.010 Slotted |
| 35                                  | to 36   | Brown Sandy Clay                      |      |                                    |
| 36                                  | to 50   | Brown Silty Sand                      |      |                                    |
| 50                                  | to 51   | Brown Sandy Clay                      |      |                                    |
| 51                                  | to 52   | Gray Clay                             |      |                                    |
| 52                                  | to 53   | Gray Sand                             |      |                                    |
| 53                                  | to 55   | Gray Sand And Clay                    |      |                                    |
| 55                                  | to 60   | Gray Silty Sand                       |      |                                    |



**Installation Observed By:**

## STATE OF TEXAS WELL REPORT for Tracking #353080

|                |                              |                 |                |
|----------------|------------------------------|-----------------|----------------|
| Owner:         | USACE                        | Owner Well #:   | 50WW27         |
| Address:       | Hwy 43<br>Karnack , TX 75670 | Grid #:         | 35-23-6        |
| Well Location: | Hwy 43<br>Karnack , TX 75670 | Latitude:       | 32° 40' 42" N  |
| Well County:   | Harrison                     | Longitude:      | 094° 08' 24" W |
| Elevation:     | No Data                      | GPS Brand Used: | No Data        |

|               |          |               |         |
|---------------|----------|---------------|---------|
| Type of Work: | New Well | Proposed Use: | Monitor |
|---------------|----------|---------------|---------|

Drilling Date: Started: 8/8/2013

Completed: 9/18/2013

Diameter of Hole: Diameter: 8 in From Surface To 60 ft

Drilling Method: Hollow Stem Auger

Borehole Completion: Other: 20/40 Silica Sand

Annular Seal Data:

1st Interval: From 0 ft to 2 ft with Concrete (#sacks and material)

2nd Interval: From 2 ft to 35 ft with Grout (#sacks and material)

3rd Interval: From 35 ft to 40.5 ft with Bentonite (#sacks and material)

Method Used: Tremmie

Cemented By: Crew

Distance to Septic Field or other Concentrated Contamination: No Data

Distance to Property Line: No Data

Method of Verification: No Data

Approved by Variance: No Data

Surface Slab Installed

Surface Completion:

Water Level:

Static level: No Data

Artesian flow: No Data

Packers:

No Data

Plugging Info:

Casing or Cement/Bentonite left in well: No Data

Type Of Pump:

No Data

Well Tests:

No Data

Water Quality:

Type of Water: No Data

Depth of Strata: No Data

Chemical Analysis Made: No Data

Did the driller knowingly penetrate any strata which contained undesirable constituents: No Data

Certification Data:

The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company Information:

Total Support Services

4647 Brass Way

Dallas , TX 75236

Driller License Number:

54611

Licensed Well Driller Signature: **Brian Kern**

Registered Driller Apprentice Signature: **No Data**


Apprentice Registration Number: **No Data**

Comments: **No Data**

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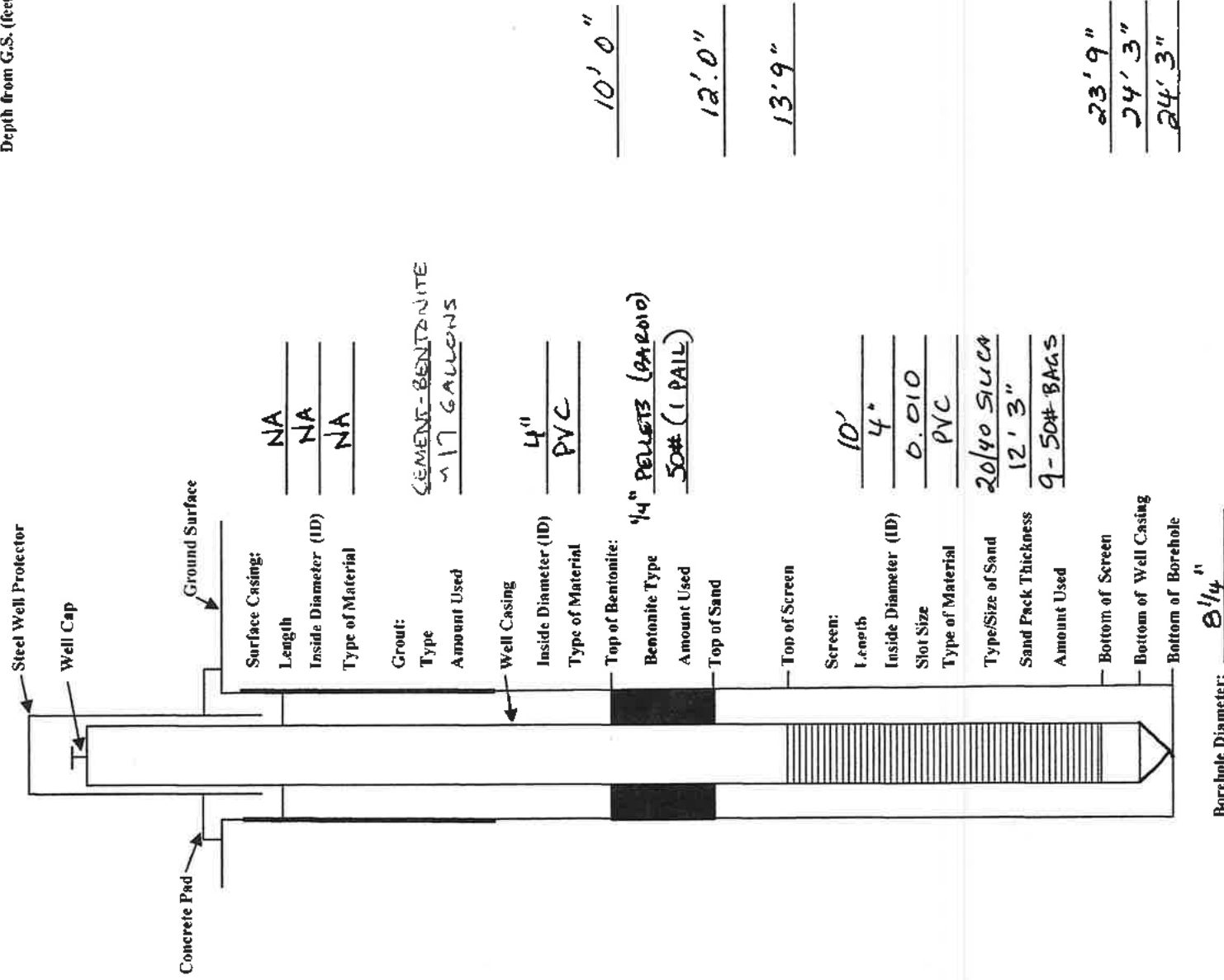
**Texas Department of Licensing & Regulation**  
P.O. Box 12157  
Austin, TX 78711  
(512) 463-7880 

| DESC. & COLOR OF FORMATION MATERIAL |                                 | CASING, BLANK PIPE & WELL SCREEN DATA |                                |
|-------------------------------------|---------------------------------|---------------------------------------|--------------------------------|
| From (ft)                           | To (ft) Description             | Dia. New/Used                         | Type Setting From/To           |
| 0                                   | to 10 Gray Red Brown Silty Clay | 2 New                                 | PVC Riser 0/43 Sched. 40       |
| 10                                  | to 35 Brown Silty Sand          | 2 New                                 | PVC Screen 43/58 0.010 Slotted |
| 35                                  | to 36 Brown Sandy Clay          |                                       |                                |
| 36                                  | to 50 Brown Silty Sand          |                                       |                                |
| 50                                  | to 55 Gray Sand And Clay        |                                       |                                |
| 55                                  | to 60 Gray Silty Sand           |                                       |                                |

|                     |                                 |                                  |
|---------------------|---------------------------------|----------------------------------|
| <b>A-<u>COM</u></b> | Client: <u>USACE</u>            | WELL ID: <u>50W28</u>            |
|                     | Project Number: <u>60256135</u> | Date Installed: <u>5/6/14</u>    |
|                     | Site Location: <u>LHAPP-50</u>  | Borehole Diameter: <u>8 1/4"</u> |
|                     | Well Location: <u>HSA</u>       | Contractor: <u>FUGRO</u>         |
|                     | Method: <u>HSA</u>              |                                  |

## MONITORING WELL CONSTRUCTION DETAIL

Depth from G.S. (feet)



Comments:

Installation Observed By:

G. McDONNELL

50WN10

|                                    |  |   |  |  |  |  |  |
|------------------------------------|--|---|--|--|--|--|--|
| <b>Ry Moh 6859</b><br><b>AECOM</b> |  | Client: <u>USACE</u><br>Project Number: <u>60256135</u><br>Site Location: <u>S.T. 50</u><br>Coordinates: _____<br>Drilling Method: <u>USA</u><br>Sample Type(s): <u>Core</u> <u>Comp. Test</u> <u>Mills</u><br>Weather: <u>Clear</u><br>Drilling Contractor: <u>ELABO TSD</u> |  | Elevation<br>Boring Diameter: <u>8</u><br>Date/Time Started: <u>930 8/24/13</u><br>Date/Time Finished: _____<br>Water Level: <u>18.5</u> |  | BORING ID: <u>50WN10A3</u><br>Sheet 1 of 6<br>Monitoring Well Installed:<br>Screened Interval: |  |
|------------------------------------|--|---|--|--|--|--|--|

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per ft | Recovery (Inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|-------------------|-----------------|----------|--|---------------|-----------------------|
| 1          |                    |                   |              |                   |                 |          |  |               |                       |
| 2          |                    |                   |              |                   |                 |          |  |               |                       |
| 3          |                    |                   |              |                   |                 |          |  |               |                       |
| 4          |                    |                   |              |                   |                 |          |  |               |                       |
| 5          |                    |                   |              |                   |                 |          |  |               |                       |
| 6          |                    |                   |              |                   |                 |          |  |               |                       |
| 7          |                    |                   |              |                   |                 |          |  |               |                       |
| 8          |                    |                   |              |                   |                 |          |  |               |                       |
| 9          |                    |                   |              |                   |                 |          |  |               |                       |
| 10         |                    |                   |              |                   |                 |          |  |               |                       |
| 11         |                    |                   |              |                   |                 |          |  |               |                       |
| 12         |                    |                   |              |                   |                 |          |  |               |                       |
| 13         |                    |                   |              |                   |                 |          |  |               |                       |
| 14         |                    |                   |              |                   |                 |          |  |               |                       |
| 15         |                    |                   |              |                   |                 |          |  |               |                       |
| 16         |                    |                   |              |                   |                 |          |  |               |                       |
| 17         |                    |                   |              |                   |                 |          |  |               |                       |
| 18         |                    |                   |              |                   |                 |          |  |               |                       |
| 19         |                    |                   |              |                   |                 |          |  |               |                       |
| 20         |                    |                   |              |                   |                 |          |  |               |                       |

**NOTES:** Silty Fine sand color change appear as staining and may be bedding related although no grain size difference noted

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

00954129

50WN10

| <b>AECOM</b><br>Client: <u>IASACE</u><br>Project Number: <u>60256135</u><br>Site Location: <u>S.G 50</u><br>Coordinates:<br>Drilling Method: <u>HSA</u><br>Sample Type(s): <u>Mills Continuous</u><br>Boring Diameter: <u>8</u><br>Date/Time Started:<br>Date/Time Finished: |                    | BORING ID: <u>50WN10</u>   |                |                   |                 |        |  |               |                       |
|--|--------------------|----------------------------|----------------|-------------------|-----------------|--------|--|---------------|-----------------------|
|  |                    | Sheet 2 of 6               |                |                   |                 |        |  |               |                       |
|  |                    | Monitoring Well Installed: |                |                   |                 |        |  |               |                       |
|  |                    | Screened Interval:         |                |                   |                 |        |  |               |                       |
| Weather: <u>Clear</u>  |                    | Depth of Boring:           |                |                   |                 |        |  |               |                       |
| Drilling Contractor: <u>JSS</u>  |                    | Water Level:               |                |                   |                 |        |  |               |                       |
| Depth (ft)   | Geologic Sample ID | Sample Depth (ft)          | Blows per Foot | Recovery (inches) | Headspace (ppm) | U.S.C. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 21   |                    |                            |                |                   |                 |        |  |               |                       |
| 22   |                    |                            |                |                   |                 |        |  |               |                       |
| 23   |                    |                            |                |                   |                 |        |  |               |                       |
| 24   |                    |                            |                |                   |                 |        |  |               |                       |
| 25   |                    |                            |                |                   |                 |        |  |               |                       |
| 26   |                    |                            |                |                   |                 |        |  |               |                       |
| 27   |                    |                            |                |                   |                 |        |  |               |                       |
| 28   |                    |                            |                |                   |                 |        |  |               |                       |
| 29   |                    |                            |                |                   |                 |        |  |               |                       |
| 30   |                    |                            |                |                   |                 |        |  |               |                       |
| 31   |                    |                            |                |                   |                 |        |  |               |                       |
| 32   |                    |                            |                |                   |                 |        |  |               |                       |
| 33   |                    |                            |                |                   |                 |        |  |               |                       |
| 34   |                    |                            |                |                   |                 |        |  |               |                       |
| 35   |                    |                            |                |                   |                 |        |  |               |                       |
| 36   |                    |                            |                |                   |                 |        |  |               |                       |
| 37   |                    |                            |                |                   |                 |        |  |               |                       |
| 38   |                    |                            |                |                   |                 |        |  |               |                       |
| 39   |                    |                            |                |                   |                 |        |  |               |                       |
| 40   |                    |                            |                |                   |                 |        |  |               |                       |

NOTES: Drilled with 4" ID HSA to  
 Sampled with a Mills Continuous Sampler - 64  
 Reamed hole using 10" wash rotary to  
 Set 6" IN IP SCH 40 PVC Sump Casing to 64

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

00954130



50WN10

| <h1 style="text-align: center;">AECOM</h1> |                    | Client: <b>USACE</b>                  |                     | Boring ID: <b>50WN10</b>    |                 |          |  |               |                       |
|--|--------------------|---------------------------------------|---------------------|-----------------------------|-----------------|----------|--|---------------|-----------------------|
|  |                    | Project Number: <b>60256135</b>       |                     |                             |                 |          |  |               |                       |
|  |                    | Site Location: <b>S.G. 50</b>         |                     |                             |                 |          |  |               |                       |
|  |                    | Coordinates: <b>11 50 50</b>          |                     | Elevation                   |                 |          |  |               |                       |
| Drilling Method: <b>HSA</b>                |                    | Sample Type(s): <b>milli Carinaum</b> |                     | Boring Diameter: <b>8</b>   |                 |          |  |               |                       |
| Weather: <b>Clear 100%</b>                 |                    | Logged By: <b>fla-Had</b>             |                     | Date/Time Started: <b>8</b> |                 |          |  |               |                       |
| Drilling Contractor: <b>755</b>            |                    | Ground Elevation:                     |                     | Date/Time Finished:         |                 |          |  |               |                       |
| Depth (ft)                                 | Geologic Sample ID | Sample Depth (ft)                     | Blowper' Sample Run | Recovery (Inches)           | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 41   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 42   |                    |                                       |                     |                             | 0.0             | SP       | 40-40.5 Poorly Graded Fine sand with 5.44 clay laminated 11.15, 0.12 <del>trace</del> brown & gray   |               |                       |
| 43   |                    | 9                                     | 18                  |                             |                 |          | 40.5-41 Poorly Graded Fine Sand  |               |                       |
| 44   |                    |                                       |                     |                             |                 |          | 41-41.5 same as 40-40.5 - trace to the clay Gray   |               |                       |
| 45   |                    |                                       |                     |                             |                 |          | NO RECOVERY (24) -   |               |                       |
| 46   |                    |                                       |                     |                             | 0.0             |          | POORLY GRADED Fine sand, dense gray wet  |               |                       |
| 47   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 48   |                    | 10                                    | 24                  |                             |                 | SP       | NO RECOVERY  |               |                       |
| 49   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 50   |                    |                                       |                     |                             |                 |          | 50.4-50.8 clayey fine sandy clay, wet, low plasticity,   |               |                       |
| 51   |                    |                                       |                     |                             | CL - 0.0        | SP       | POORLY GRADED Fine Sand,   |               |                       |
| 52   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 53   |                    | 11                                    | 18                  |                             |                 |          | gray, wet  |               |                       |
| 54   |                    |                                       |                     |                             |                 |          | NO RECOVERY  |               |                       |
| 55   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 56   |                    |                                       |                     |                             | 0.0             |          | POORLY GRADED Fine Sand, gray  |               |                       |
| 57   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 58   |                    | 12                                    | 24                  |                             |                 |          | NO RECOVERY  |               |                       |
| 59   |                    |                                       |                     |                             |                 |          |  |               |                       |
| 60   |                    |                                       |                     |                             |                 |          |  |               |                       |

NOTES: **55-60 zone sample needs were 5' short - then sampled at the running auger down - so sample is disturbed sample from inside the auger - still in sand.**

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

00954131

50NWN10

|   |  |   |  |  |  |   |  |
|---|--|---|--|--|--|---|--|
| <b>AECOM</b><br>Client: <b>U.S.A.C.E.</b><br>Project Number: <b>60256135</b><br>Site Location: <b>S. 1/4 50</b><br>Coordinates: <b>Elevation</b><br>Drilling Method: <b>HSA</b><br>Sample Type(s): <b>Mills Continuously</b><br>Logged By: <b>Hartford</b><br>Ground Elevation: |  | Client: <b>U.S.A.C.E.</b><br>Project Number: <b>60256135</b><br>Site Location: <b>S. 1/4 50</b><br>Coordinates: <b>Elevation</b><br>Drilling Method: <b>HSA</b><br>Sample Type(s): <b>Mills Continuously</b><br>Logged By: <b>Hartford</b><br>Ground Elevation: |  | Boring Diameter: <b>8</b><br>Date/Time Started:<br>Date/Time Finished:   |  | BORING ID: <b>50NWN10</b><br>Sheet <b>4</b> of <b>8</b><br>Monitoring Well Installed:<br>Screened Interval:<br>Depth of Boring:<br>Water Level: |  |
|   |  | Weather:<br>Drilling Contractor: <b>TSS</b>   |  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |  | Lab Sample ID<br>Lab Sample Depth (ft)  |  |
|   |  | Sample Depth (ft)<br>Blows per 6"<br>Recovery (inches)<br>Headspace (ppm)   |  | U.S.C.S.   |  | Lab Sample ID<br>Lab Sample Depth (ft)  |  |
|   |  | Geologic Sample ID  |  | U.S.C.S.   |  | Lab Sample ID<br>Lab Sample Depth (ft)  |  |
| 61  |  |   |  |  |  |   |  |
| 62  |  |   |  |  |  |   |  |
| 63  |  |   |  |  |  |   |  |
| 64  |  |   |  |  |  |   |  |
| 65  |  |   |  |  |  |   |  |
| 66  |  |   |  |  |  |   |  |
| 67  |  |   |  |  |  |   |  |
| 68  |  |   |  |  |  |   |  |
| 69  |  |   |  |  |  |   |  |
| 70  |  |   |  |  |  |   |  |
| 71  |  |   |  |  |  |   |  |
| 72  |  |   |  |  |  |   |  |
| 73  |  |   |  |  |  |   |  |
| 74  |  |   |  |  |  |   |  |
| 75  |  |   |  |  |  |   |  |
| 76  |  |   |  |  |  |   |  |
| 77  |  |   |  |  |  |   |  |
| 78  |  |   |  |  |  |   |  |
| 79  |  |   |  |  |  |   |  |
| 80  |  |   |  |  |  |   |  |

## NOTES:

Soil became much harder at 61'.

Assumed top of coal.

2 Hrs. 20 min. to drill 60-63.0 Stop now prior to 65'.

Split spurs 63-64.5' - Cone to 65.5' - Split spurs 65.5-67'

Plan to set 6"-12" surface casing at 64.5'

Checked by:

Date:

To Soil sampling prior to surface casing 67'

00954132



50WN10

|   |  |                                 |  |                             |  |
|---|--|---------------------------------|--|-----------------------------|--|
| <b>A-<u>COM</u></b>                           |  | Client: <u>USACE</u>            |  | Boring ID: <u>50WN10-A3</u> |  |
|   |  | Project Number: <u>60256135</u> |  |                             |  |
|   |  | Site Location: <u>Site 50</u>   |  |                             |  |
|   |  | Coordinates:                    |  | Elevation                   |  |
| Drilling Method: <u>HSA</u>                   |  | Boring Diameter: <u>5.5"</u>    |  | Sheet 5 of 6                |  |
| Sample Type(s): <u>Mills Cuttings / Split</u> |  | Date/Time Started:              |  | Screened Interval:          |  |
| Logged By: <u>M. Law</u>                      |  | Date/Time Finished:             |  | Depth of Boring:            |  |
| Ground Elevation:                             |  |                                 |  | Water Level:                |  |

Weather: SunnyDrilling Contractor: TSS

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Stems per 6" | Recovery (inches)<br>% | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|------------------------|-----------------|----------|--|---------------|-----------------------|
| 81         |                    | Split<br>Spun     | 24           | 98%                    |                 | CL       | Lignite with few silt, black, moist, hard  |               |                       |
| 82         |                    |                   |              |                        |                 | CL       | LEAN CLAY (CL) (80.3" - 82")<br>very hard, mostly gray, mostly clay. Note fine sand, granular to little fine sand with trace mica, few phos.                       |               |                       |
| 83         |                    |                   |              |                        |                 | MR       |  |               |                       |
| 84         |                    |                   |              |                        |                 |          |  |               |                       |
| 85         |                    |                   |              |                        |                 | CL       | LEAN CLAY with SAND (CL) (85" - 85.4")<br>Hard, moist, gray, mostly clay, 1 1/4 fine sand, low phos.   |               |                       |
| 86         |                    | Split<br>Spun     | 25           | 98%                    |                 | CL       | Lignite streaks (85.4" - 85.6")  |               |                       |
| 87         |                    |                   |              |                        |                 | MR       | LEAN CLAY (CL) (85.6" - 86")<br>moist, gray, moist clay, somewhat, low phos.   |               |                       |
| 88         |                    |                   |              |                        |                 | SP       | POORLY GRAINED SAND with Silt (SP) (86" - 87")<br>Dense, gray, moist, fine sand, little silt, trace mica, bi-granular  |               |                       |
| 89         |                    |                   |              |                        |                 | MR       |  |               |                       |
| 90         |                    |                   |              |                        |                 |          |  |               |                       |
| 91         |                    | Split<br>Spun     | 26           | 74%<br>60%             |                 | SP       | POORLY GRAINED SAND with CLAY (SP) (90" - 92")<br>Dense, gray, moist, fine sand, somewhat, trace mica, slightly plastic. thin laminae                              |               |                       |
| 92         |                    |                   |              |                        |                 |          |  |               |                       |
| 93         |                    |                   |              |                        |                 |          |  |               |                       |
| 94         |                    |                   |              |                        |                 | MR       |  |               |                       |
| 95         |                    |                   |              |                        |                 |          |  |               |                       |
| 96         |                    | Split<br>Spun     | 27           | 100%                   |                 | SP       | LEAN CLAY (CL) (95" - 97")<br>very stiff, dry, very dark gray, mostly clay, few fine sand bands, low phos.   |               |                       |
| 97         |                    |                   |              |                        |                 |          |  |               |                       |
| 98         |                    |                   |              |                        |                 | MR       |  |               |                       |
| 99         |                    |                   |              |                        |                 |          |  |               |                       |
| 100        |                    |                   |              |                        |                 |          |  |               |                       |

## NOTES:

Date

Time

Depth to groundwater while drilling

Checked by:

Date:

00954133

C-18

SONWID

| AECOM                                |                    |                   |            | Client: USACE                 |                 |      |  | BORING ID: <u>50W110</u>              |                       |  |  |
|--------------------------------------|--------------------|-------------------|------------|-------------------------------|-----------------|------|--|---------------------------------------|-----------------------|--|--|
| Project Number: <u>60256135</u>      |                    |                   |            | Site Location: <u>Site 50</u> |                 |      |  | Sheet: <u>6 of 6</u>                  |                       |  |  |
| Coordinates:                         |                    |                   |            | Elevation:                    |                 |      |  | Monitoring Well Installed: <u>Yes</u> |                       |  |  |
| Drilling Method: <u>HSA/PRO Remy</u> |                    |                   |            | Boring Diameter: <u>5.5"</u>  |                 |      |  | Screened Interval:                    |                       |  |  |
| Sample Type(s): <u>Sp. 1-5</u>       |                    |                   |            | Logged By: <u>M. Low</u>      |                 |      |  | Depth of Boring: <u>110</u>           |                       |  |  |
| Weather: <u>Sunny</u>                |                    |                   |            | Ground Elevation:             |                 |      |  | Water Level:                          |                       |  |  |
| Drilling Contractor: <u>TSS</u>      |                    |                   |            | Date/Time Started:            |                 |      |  | Date/Time Finished:                   |                       |  |  |
| Depth (ft)                           | Geologic sample ID | Sample Depth (ft) | Blow count | Recovery (inches)             | Headspace (ppm) | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known) | Lab Sample ID                         | Lab Sample Depth (ft) |  |  |
| 101                                  |                    | Sp. 1 - 5 ft      | 28         | 80%                           |                 | SP   | LEAN CLAY with sand (CL) (100.2' - 100.3')<br>silt, moist, dark gray, moist clay, little sandy low plasticity.<br>this base of lignite @ 100.2' m                  |                                       |                       |  |  |
| 102                                  |                    |                   |            |                               |                 |      | POORLY GRANNED SAND (SP) (100.2' - 104)<br>brown, moist, gray, mostly medium grained sand, sub-angular, few s.s. fragments, porous white fm.                       |                                       |                       |  |  |
| 103                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 104                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 105                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 106                                  |                    | Sp. 2 - 5 ft      | 29         | 30%                           |                 | SP   | POORLY GRANNED SAND (SP) (105 - 107)<br>dense, moist, gray, mostly sand, medium grain, fine-sand, non-plastic, few s.s. silt.                                      |                                       |                       |  |  |
| 107                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 108                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 109                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 110                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 111                                  |                    | Sp. 3 - 5 ft      | 30         | 80%                           |                 | CL   | LEAN CLAY (CL) (110' - 112)<br>stiff, moist, dark gray, mostly clay, few sand, lumpiness, few s.s.   |                                       |                       |  |  |
| 112                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 113                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 114                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 115                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 116                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 117                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 118                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 119                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |
| 120                                  |                    |                   |            |                               |                 |      |  |                                       |                       |  |  |

NOTES:

Date Time Depth to groundwater while drilling

Checked by

Date

**AECOM**Client: **USACE**Project Number: **6056135**Site Location: **Site 50**

Coordinates:

Drilling Method: **DPT/HSA**Sample Type(s): **Mudstone / Mill barrel**Logged By: **M. Law**

Ground Elevation:

Weather: **Sunny 90°**Drilling Contractor: **Fugro**

Elevation:

Boring Diameter: **2"**Date/Time Started: **7/23/13 1307**Date/Time Finished: **7/23/13 0915**Monitoring Well Installed: **Yes**Screened Interval: **20'-35'**Depth of Boring: **30'/35'**

Water Level:

| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Blowcount | Recovery (ft/3) | Headspace (ppm) | U.S.C.S | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|-----------|-----------------|-----------------|---------|--|---------------|-----------------------|
| 1          |                    | 0-1'              |           | ~100%           |                 | ML      | <u>SILT (ML) (0-1')</u><br>Dry, Brown, mostly silt, fine grain, trace fine sand, non-plastic   |               |                       |
| 2          |                    | 1'                |           | ~100%           |                 | CL      | <u>LEAN CLAY (1-5')</u><br>moist to dry, strong brown to gray, fine grain, red mottling, low plasticity, stiff   |               |                       |
| 3          |                    |                   |           |                 |                 | CL      | <u>SAME AS ABOVE (5'-9')</u><br>Brownish gray, medium plasticity, black mottles at 7'-10.5' interval, stiff  |               |                       |
| 4          |                    |                   |           |                 |                 |         |  |               |                       |
| 5          |                    | 5'                |           |                 |                 |         |  |               |                       |
| 6          |                    |                   |           |                 |                 |         |  |               |                       |
| 7          |                    |                   |           | ~100%           |                 |         |  |               |                       |
| 8          |                    |                   |           |                 |                 |         |  |               |                       |
| 9          |                    | 9'                |           |                 |                 | ML      | <u>SILT (ML) (9'-10')</u><br>Dry, Gray, mostly silt, trace fine sand, few clay, slightly plasticity  |               |                       |
| 10         |                    | 10'               |           |                 |                 |         |  |               |                       |
| 11         |                    |                   |           |                 |                 | SP      | <u>Poorly Graded Sand (SP) (10'-12')</u><br>Dry, Brown to gray, mostly fine sand, trace silt, non-plastic  |               |                       |
| 12         |                    | 12'               | 3         | ~50%            |                 |         |  |               |                       |
| 13         |                    |                   |           |                 |                 | NR      | <u>(NR) No Recovery (12'-15')</u>  |               |                       |
| 14         |                    |                   |           |                 |                 |         |  |               |                       |
| 15         |                    | 15'               |           |                 |                 | ML      | <u>SILT mixed sand (ML) (15'-20')</u><br>moist, Brown, mostly silt, little fine sand, non-plastic, trace mix   |               |                       |
| 16         |                    |                   |           |                 |                 |         |  |               |                       |
| 17         |                    |                   | 4         | 65%             |                 |         |  |               |                       |
| 18         |                    |                   |           |                 |                 |         |  |               |                       |
| 19         |                    |                   |           |                 |                 |         |  |               |                       |
| 20         |                    | 20'               |           |                 |                 |         |  |               |                       |

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by

Date:

00954135

C-20

| AECOM                |                   |                |              |                 |      | Client: USACE  |  | BORING ID: 50BPT-04        |  |
|----------------------|-------------------|----------------|--------------|-----------------|------|--|--|----------------------------|--|
| Project Number:      |                   |                |              |                 |      | Site Location: S-4 SD  |  | Sheet: 2 of 2              |  |
| Coordinates:         |                   |                |              |                 |      | Elevation:   |  | <del>50BPT-04</del>        |  |
| Drilling Method:     |                   |                |              |                 |      | Boring Diameter:   |  | Monitoring Well Installed: |  |
| Sample Type(s):      |                   |                |              |                 |      | Logged By:   |  | Screened Interval:         |  |
|                      |                   |                |              |                 |      | Ground Elevation:  |  | Depth of Boring:           |  |
|                      |                   |                |              |                 |      | Date/Time Started:   |  | Water Level:               |  |
| Weather:             |                   |                |              |                 |      | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) |  |                            |  |
| Drilling Contractor: |                   |                |              |                 |      |  |  |                            |  |
| Geologic sample ID   | Sample Depth (ft) | Blows per foot | Recovery (%) | Headspace (ppm) | USCS |  |  |                            |  |
|                      | 21                |                |              |                 | SP   | Poorly Graded Sand with silt (SP) (2'-30')   |  |                            |  |
|                      | 22                | 5              | ~75%         |                 |      | Moist, yellowish brown, fine grained, mostly fine sand, 1-4% silt, trace water, non-plastic.   |  |                            |  |
|                      | 23                |                |              |                 |      |  |  |                            |  |
|                      | 24                |                |              |                 |      |  |  |                            |  |
|                      | 25                |                |              |                 |      |  |  |                            |  |
|                      | 26                |                |              |                 | SP   | SAME AS ABOVE  |  |                            |  |
|                      | 27                | 6              | ~75%         |                 |      | Wet to moist   |  |                            |  |
|                      | 28                |                |              |                 |      |  |  |                            |  |
|                      | 29                |                |              |                 |      |  |  |                            |  |
|                      | 30                |                |              |                 |      | DPT<br>End of boring @ 30' Bgs   |  |                            |  |
|                      | 31                |                |              |                 |      |  |  |                            |  |
|                      | 32                |                |              |                 | SP   | SAME AS ABOVE  |  |                            |  |
|                      | 33                | 7              | ~50%         |                 |      |  |  |                            |  |
|                      | 34                |                |              |                 |      |  |  |                            |  |
|                      | 35                |                |              |                 |      | End of HSA Boring @ 35' Bgs  |  |                            |  |
|                      | 36                |                |              |                 |      |  |  |                            |  |
|                      | 37                |                |              |                 |      |  |  |                            |  |
|                      | 38                |                |              |                 |      |  |  |                            |  |
|                      | 39                |                |              |                 |      |  |  |                            |  |
|                      | 40                |                |              |                 |      |  |  |                            |  |

Lab Sample ID      Lab Sample Depth (ft.)

11/17/8 →

**NOTES:** Hydro punch sample screen interval (31'-35') Bgs

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

50WN12

|                                   |                                 |  |                          |                                       |
|-----------------------------------|---------------------------------|--|--------------------------|---------------------------------------|
| <b>A=COM</b>                      | Client: <u>USACE</u>            |  | Boring ID: <u>50WN12</u> |                                       |
|                                   | Project Number: <u>6D256135</u> |  |                          |                                       |
|                                   | Site Location: <u>Site 50</u>   |  |                          |                                       |
|                                   | Coordinates:                    |  | Elevation                |                                       |
| Drilling Method: <u>HSA</u>       |                                 | Boring Diameter: <u>8"</u>                   |                          | Sheet 1 of 2                          |
| Sample Type(s): <u>All barrel</u> |                                 | Date/Time Started: <u>8/25/00</u> <u>Dis</u> |                          | Monitoring Well Installed: <u>YLS</u> |
| Logged By: <u>M. Law</u>          |                                 | Date/Time Finished: <u>8/</u>                |                          | Screened Interval: <u>20-35'</u>      |
| Ground Elevation:                 |                                 |  |                          | Depth of Boring: <u>35'</u>           |
| Weather: <u>Sunny 95°</u>         |                                 |  |                          | Water Level:                          |
| Drilling Contractor: <u>TSS</u>   |                                 |  |                          |                                       |

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)  | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|-------------------|-----------------|----------|---|---------------|-----------------------|
| 1          | <del>sample</del>  | 1'-               |              |                   |                 | ML       | <u>SILT (m) (0-1')</u><br><u>Dry, silty, pale brown, mostly silt, few fine sand, non-plastic.</u>   |               |                       |
| 2          |                    |                   | 1            | ~20%              |                 | CL       |   |               |                       |
| 3          |                    |                   |              |                   |                 | NR       | <u>LEAN CLAY (CL) ABOVE WITH SAND</u><br><u>Dry, stiff, brown, mostly clay, <del>fine</del> fine sand, medium plasticity, reddish brown and light gray mottles, trace sand bands above 6' 9"</u>                |               |                       |
| 4          |                    |                   |              |                   |                 | CL       |   |               |                       |
| 5          |                    |                   |              |                   |                 |          |   |               |                       |
| 6          |                    |                   |              |                   |                 |          |   |               |                       |
| 7          |                    |                   |              |                   |                 |          |   |               |                       |
| 8          |                    |                   | 2            | ~100%             |                 |          | <u>- becoming light bluish gray with yellowish brown mottles below 8' 5" Bgs. few sand</u>  |               |                       |
| 9          |                    |                   |              |                   |                 |          |   |               |                       |
| 10         |                    |                   |              |                   |                 |          |   |               |                       |
| 11         |                    |                   |              |                   |                 | SP       | <u>POORLY GRADED SAND (SD)</u><br><u>moist, <del>light</del> yellowish brown with light bluish gray banding, <del>medium</del> mostly fine sand, few silt, fine clay in <del>the</del> banding; trace mica.</u> |               |                       |
| 12         |                    |                   | 3            | ~90%              |                 |          |   |               |                       |
| 13         |                    |                   |              |                   |                 |          |   |               |                       |
| 14         |                    |                   |              |                   |                 |          |   |               |                       |
| 15         |                    |                   |              |                   |                 |          |   |               |                       |
| 16         |                    |                   |              |                   |                 |          |   |               |                       |
| 17         |                    |                   | 4            | ~80%              |                 |          | <u>SAME AS ABOVE</u><br><u>wet, <del>fine</del> <sup>medium</sup> fine, medium dense, yellowish brown, with light bluish gray bands of sand with clay.</u>  |               |                       |
| 18         |                    |                   |              |                   |                 |          |   |               |                       |
| 19         |                    |                   |              |                   |                 |          |   |               |                       |
| 20         |                    |                   |              |                   |                 |          |   |               |                       |

## NOTES:

Date Time Depth to groundwater while drilling

Checked by:

Date:

00954137

C-22

50NWN12

| A=COM                |                    | Client: <u>USACE</u>          |                   | Project Number: <u>60256135</u> |          | BORING ID: <u>50NWN12</u>  |               |                       |
|----------------------|--------------------|-------------------------------|-------------------|---------------------------------|----------|--|---------------|-----------------------|
|                      |                    | Site Location: <u>Site 50</u> |                   | Coordinates:                    |          | Sheet 2 of 2   |               |                       |
|                      |                    | Drilling Method:              |                   | Elevation                       |          | Monitoring Well Installed:   |               |                       |
|                      |                    | Sample Type(s):               |                   | Boring Diameter:                |          | Screened Interval:   |               |                       |
| Weather:             |                    | Logged By:                    |                   | Date/Time Started:              |          | Depth of Boring:   |               |                       |
| Drilling Contractor: |                    | Ground Elevation:             |                   | Date/Time Finished:             |          | Water Level:   |               |                       |
| Depth (ft)           | Geologic Sample ID | Sample Depth (ft)             | Recovery (inches) | Headspace (ppm)                 | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 21                   |                    |                               |                   |                                 |          |  |               |                       |
| 22                   |                    |                               |                   |                                 |          |  |               |                       |
| 23                   |                    |                               |                   |                                 |          |  |               |                       |
| 24                   |                    |                               |                   |                                 |          |  |               |                       |
| 25                   |                    |                               |                   |                                 |          |  |               |                       |
| 26                   |                    |                               |                   |                                 |          |  |               |                       |
| 27                   |                    |                               |                   |                                 |          |  |               |                       |
| 28                   |                    |                               |                   |                                 |          |  |               |                       |
| 29                   |                    |                               |                   |                                 |          |  |               |                       |
| 30                   |                    |                               |                   |                                 |          |  |               |                       |
| 31                   |                    |                               |                   |                                 |          |  |               |                       |
| 32                   |                    |                               |                   |                                 |          |  |               |                       |
| 33                   |                    |                               |                   |                                 |          |  |               |                       |
| 34                   |                    |                               |                   |                                 |          |  |               |                       |
| 35                   |                    |                               |                   |                                 |          |  |               |                       |
| 36                   |                    |                               |                   |                                 |          |  |               |                       |
| 37                   |                    |                               |                   |                                 |          |  |               |                       |
| 38                   |                    |                               |                   |                                 |          |  |               |                       |
| 39                   |                    |                               |                   |                                 |          |  |               |                       |
| 40                   |                    |                               |                   |                                 |          |  |               |                       |

5  
 6  
 7

~80%  
 ~80%  
 ~40%

SP  
 SP  
 SP

POORLY GRAPPIED SAND (SO)  
 wet, loose, yellowish brown, mostly fine sand,  
 few silt, trace mica, non-plastic, trace  
 bluish gray bands @ 22' Bgs.  
 - Iron oxide staining @ 24.3' Bgs -  
 SAME AS ABOVE  
 clay stringers @ 29' Bgs below  
 SAME AS ABOVE  
 laminated with few silts, trace iron oxide  
 stained bands.  
 End of Boring @ 35' Bgs

NOTES:

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

Depth to groundwater while drilling

00954138

C-23

50NW14

|   |                   |  |                   |  |          |  |
|---|-------------------|--|-------------------|--|----------|--|
| <b>AECOM</b><br>Client: USACE 613<br>Project Number: 60254105<br>Site Location: CHAAP SITE 50<br>Coordinates:<br>Drilling Method: DPT/HSA<br>Sample Type(s): Core/Borehole<br>Boring Diameter: 2"<br>Date/Time Started: 0950<br>Date/Time Finished: ML<br>Ground Elevation: ML<br>Weather: Sunny Warm Bds<br>Drilling Contractor: FUGRO |                   | Elevation:<br>Monitoring Well Installed: Yes<br>Screened Interval:<br>Depth of Boring:<br>Water Level:   |                   | BORING ID:<br>50 DPT 03<br>Sheet: 1 of 4 |          | Lab Sample ID<br>Depth (ft)  |
|   |                   | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) |                   |  |          |  |
| 1   | 0-0.5'            | Blows per ft   | Recovery (Inches) | Headspace (ppm)                          | U.S.C.S. | 0-2.0'<br>SILTY FINE SAND, BROWN, DRY  |
| 2   | 0.5-3.0           | 1  | 60"               | 0.0                                      | SM       | 2.0-5.0 SILTY CLAY, reddish-brown and light gray mottling, DAMP, VERY STIFF<br>2.0-4.0 oxidation mottling - red-brown<br>4.0-5.0 mottling more yellow than red-brown |
| 3   | 4.5-5.0 (1.0 DPT) |  |                   | 0.0                                      | CL       | 5.0-9.5 SILTY CLAY, Yellow and light gray mottling, VERY STIFF, DAMP<br>7.0-9.0 minor black oxidation scattered throughout the interval                              |
| 4   | 9.5-10.0          | 2  | 60"               | 0.0                                      | SC       | 9.5-10.0 CLAYEY FINE SAND, Reddish-brown and light gray mottling, DAMP   |
| 5   |                   | 3  | 36"               |  | SM       | 10.0-15.0 SILTY FINE SAND, Reddish-brown with some light gray mottling, DAMP   |
| 6   |                   | 4  | 53"               | 0.0                                      |          | 15.0-20.0 SILTY FINE SAND, Reddish-brown. Minor light gray laminations rarely. DAMP<br>15.0-16.5 LIGHT REDDISH YELLOW CLAY, DAMP                                     |
| 7   |                   |  |                   |  |          | 19.5' GROUNDWATER MEASURED @ 1500  |
| 8   |                   |  |                   |  |          |  |
| 9   |                   |  |                   |  |          |  |
| 10  |                   |  |                   |  |          |  |
| 11  |                   |  |                   |  |          |  |
| 12  |                   |  |                   |  |          |  |
| 13  |                   |  |                   |  |          |  |
| 14  |                   |  |                   |  |          |  |
| 15  |                   |  |                   |  |          |  |
| 16  |                   |  |                   |  |          |  |
| 17  |                   |  |                   |  |          |  |
| 18  |                   |  |                   |  |          |  |
| 19  |                   |  |                   |  |          |  |
| 20  |                   |  |                   |  |          |  |

NOTES:

Date Time Depth to groundwater while drilling

Checked by Date:

| AECOM   |                    | Client: <u>USACG</u>          |                   | 50NW14                      |      |  |               |                        |
|---|--------------------|-------------------------------|-------------------|-----------------------------|------|--|---------------|------------------------|
| Project Number:                               |                    | Project Number: <u>50NW14</u> |                   | BORING ID: <u>50 DPT.03</u> |      |  |               |                        |
| Site Location:                                |                    | Site Location:                |                   | Sheet: <u>Top</u>           |      |  |               |                        |
| Coordinates:                                  |                    | Coordinates:                  |                   | Monitoring Well Installed:  |      |  |               |                        |
| Drilling Method:                              |                    | Drilling Method:              |                   | Screened Interval:          |      |  |               |                        |
| Sample Type(s):                               |                    | Sample Type(s):               |                   | Depth of Boring:            |      |  |               |                        |
| Weather:                                      |                    | Weather:                      |                   | Water Level:                |      |  |               |                        |
| Drilling Contractor:                          |                    | Drilling Contractor:          |                   | Boring Diameter:            |      |  |               |                        |
| Logged By:                                    |                    | Logged By:                    |                   | Date/Time Started:          |      |  |               |                        |
| Ground Elevation:                             |                    | Ground Elevation:             |                   | Date/Time Finished:         |      |  |               |                        |
| Depth (ft)                                    | Geologic sample ID | Sample Depth (ft)             | Recovery (inches) | Headspace (ppm)             | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft.) |
| 21  |                    |                               |                   |                             |      |  |               |                        |
| 22  |                    |                               | 5 41"             |                             |      | 20-25.0' SILTY FINE SAND, MOIST, Reddish-brown   |               |                        |
| 23  |                    |                               |                   |                             |      |  |               |                        |
| 24  |                    |                               |                   |                             |      |  |               |                        |
| 25  |                    |                               |                   |                             | SM   |  |               |                        |
| 26  |                    |                               |                   |                             |      | 25.0-28.5 SILTY FINE SAND, MOIST, Reddish-brown  |               |                        |
| 27  |                    |                               | 6 60"             |                             |      |  |               |                        |
| 28  |                    |                               |                   |                             |      | 28.5-30.0 SILTY FINE SAND, WET, Reddish-brown  |               |                        |
| 29  |                    |                               |                   |                             |      |  |               |                        |
| 30  |                    |                               |                   | 8.0                         |      |  |               |                        |
| 31  |                    |                               |                   |                             | SP   | POREY GRAINED SAND WITH SILT (SP)  |               |                        |
| 32  |                    |                               |                   |                             |      | moist, loose, Brown, mostly fine sand, 1.4% silt, trace mica, trace iron oxide staining is stringers.  |               |                        |
| 33  |                    |                               | 7 ~60%            |                             |      |  |               |                        |
| 34  |                    |                               |                   |                             |      |  |               |                        |
| 35  |                    |                               |                   |                             |      |  |               |                        |
| 36  |                    |                               |                   |                             |      |  |               |                        |
| 37  |                    |                               |                   |                             |      |  |               |                        |
| 38  |                    |                               | 8 ~60%            |                             |      | SAME AS ABOVE trace clay stringers   |               |                        |
| 39  |                    |                               |                   |                             |      |  |               |                        |
| 40  |                    |                               |                   |                             |      |  |               |                        |
| NOTES: WATER SAMPLE @ 1155'; 25'-30' INTERVAL |                    |                               |                   |                             |      | 8/26/8   |               |                        |

Checked by

Date:



50WW14

|   |  |  |  |  |                    |  |                       |                   |                 |          |  |               |                       |    |    |    |    |    |    |    |    |    |    |
|---|--|--|--|--|--------------------|--|-----------------------|-------------------|-----------------|----------|--|---------------|-----------------------|----|----|----|----|----|----|----|----|----|----|
| <b>AECOM</b><br>Client: <u>USACE</u><br>Project Number: <u>60256130</u><br>Site Location: <u>Site 50</u><br>Coordinates: <u>Elevation</u><br>Drilling Method: <u>DPT/HSA</u><br>Sample Type(s): <u>Boring Diameter:</u><br>Logged By: <u>M. Law</u><br>Ground Elevation: <u>                    </u><br>Weather: <u>                    </u><br>Drilling Contractor: <u>                    </u><br>Date/Time Started: <u>                    </u><br>Date/Time Finished: <u>                    </u><br>Water Level: <u>                    </u> |  |  |  | BORING ID: <u>50WW14</u><br><u>50W022</u><br><u>50W0703</u>  |                    | Sheet 3 of <u>4</u><br>Monitoring Well Installed: <u>Yes</u><br>Screened Interval: <u>                    </u><br>Depth of Boring: <u>                    </u><br>Water Level: <u>                    </u> |                       |                   |                 |          |  |               |                       |    |    |    |    |    |    |    |    |    |    |
|   |  |  |  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |                    | Lab Sample ID  | Lab Sample Depth (ft) |                   |                 |          |  |               |                       |    |    |    |    |    |    |    |    |    |    |
|   |  |  |  | Depth (ft)   | Geologic Sample ID | Sample Depth (ft)  | Blows per 6"          | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |    |    |    |    |    |    |    |    |    |    |
|   |  |  |  | 41   | 42                 | 43   | 44                    | 45                | 46              | 47       | 48   | 49            | 50                    | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
|   |  |  |  | 9  | 10                 | 11   | 12                    | 13                | 14              | 15       | 16   | 17            | 18                    | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |

NOTES: Very dark clay on August ~ 50' Bgs, medium plasticity, brown

Checked by:

Date:

Date Time Depth to groundwater while drilling

50XW14

**A=COM**

Client: USACE  
 Project Number: 60256135  
 Site Location: Site 50  
 Coordinates: \_\_\_\_\_  
 Drilling Method: \_\_\_\_\_  
 Sample Type(s): \_\_\_\_\_

~~50W14-22~~  
 BORING ID:  
50DPT03

Elevation

Sheet 4 of 4  
 Monitoring Well Installed:  
 Screened Interval:  
 Depth of Boring:  
 Water Level:

Weather: \_\_\_\_\_  
 Drilling Contractor: \_\_\_\_\_  
 Logged By: M. LSW  
 Ground Elevation: \_\_\_\_\_

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per 6" | Recovery (measured %) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)                   | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|-----------------------|-----------------|----------|--|---------------|-----------------------|
| 61         |                    | 0.2' -            |              |                       | Coal →          |          | - thin layer of lignite @ 60' Bgs -  |               |                       |
| 62         |                    |                   | 13           | ~ 100%                |                 | SP/L     | Inter-bedded Sand (SP) and Clay (CL)<br>Dry, light gray, dense to hard, fine sand and clay,<br>few silt with clays laminations, trace mica in<br>sands, more laminations with depth. |               |                       |
| 63         |                    | 24/40             |              |                       |                 | CL       |  |               |                       |
| 64         |                    | 60/90             | 14           | ~ 100%                |                 |          | LEAN CLAY (CL)<br>Dry, very stiff, very dark gray, mostly clay, few fine<br>sand bands, low plasticity, trace mica.  |               |                       |
| 65         |                    | 75 (SS)           |              |                       |                 |          | End of Boring @ 64.5' Bgs  | 51/62/8 →     |                       |
| 66         |                    |                   |              |                       |                 |          |  |               |                       |
| 67         |                    |                   |              |                       |                 |          |  |               |                       |
| 68         |                    |                   |              |                       |                 |          |  |               |                       |
| 69         |                    |                   |              |                       |                 |          |  |               |                       |
| 70         |                    |                   |              |                       |                 |          |  |               |                       |
| 71         |                    |                   |              |                       |                 |          |  |               |                       |
| 72         |                    |                   |              |                       |                 |          |  |               |                       |
| 73         |                    |                   |              |                       |                 |          |  |               |                       |
| 74         |                    |                   |              |                       |                 |          |  |               |                       |
| 75         |                    |                   |              |                       |                 |          |  |               |                       |
| 76         |                    |                   |              |                       |                 |          |  |               |                       |
| 77         |                    |                   |              |                       |                 |          |  |               |                       |
| 78         |                    |                   |              |                       |                 |          |  |               |                       |
| 79         |                    |                   |              |                       |                 |          |  |               |                       |
| 80         |                    |                   |              |                       |                 |          |  |               |                       |

**NOTES:**

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by: \_\_\_\_\_

Date: \_\_\_\_\_

00954142

50WW15

| AECOM                      |                    |                   |                | Client: USACE                   |                 |          |  |               |                       |
|----------------------------|--------------------|-------------------|----------------|---------------------------------|-----------------|----------|--|---------------|-----------------------|
|                            |                    |                   |                | Project Number: 60366135        |                 |          |  |               |                       |
|                            |                    |                   |                | Site Location: 546 50           |                 |          |  |               |                       |
|                            |                    |                   |                | Coordinates:                    |                 |          |  |               |                       |
|                            |                    |                   |                | Drilling Method: DPT            |                 |          |  |               |                       |
|                            |                    |                   |                | Sample Type(s): Mucilage        |                 |          |  |               |                       |
| Weather: Sunny 82° F       |                    |                   |                | Logged By: M. Low               |                 |          |  |               |                       |
| Drilling Contractor: Fugro |                    |                   |                | Date/Time Started: 7/13/13 0915 |                 |          |  |               |                       |
|                            |                    |                   |                | Ground Elevation: 7.57/13       |                 |          |  |               |                       |
|                            |                    |                   |                | Boring Diameter: 2"             |                 |          |  |               |                       |
|                            |                    |                   |                | Date/Time Finished: 7/25/13     |                 |          |  |               |                       |
|                            |                    |                   |                | Depth of Boring: 25'            |                 |          |  |               |                       |
|                            |                    |                   |                | Water Level:                    |                 |          |  |               |                       |
|                            |                    |                   |                | Screened Interval:              |                 |          |  |               |                       |
|                            |                    |                   |                | Sheet: 1 of 2                   |                 |          |  |               |                       |
|                            |                    |                   |                | Monitoring Well Installed: No   |                 |          |  |               |                       |
|                            |                    |                   |                | Yes                             |                 |          |  |               |                       |
| Depth (ft)                 | Geologic sample ID | Sample Depth (ft) | Blows per foot | Recovery (inches)               | Headspace (gpm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known)                             | Lab Sample ID | Lab Sample Depth (ft) |
| 1                          |                    | 0'                |                |                                 |                 | ML       | <u>SILT (ML) (0-5')</u><br>Dry, Dark yellowish brown granulating to brownish yellow, mostly silt, fine grain, non-plastic, some fine sand at first foot of sample.                             |               |                       |
| 2                          |                    |                   | 1              | ~60%                            |                 |          |  |               |                       |
| 3                          |                    |                   |                |                                 |                 |          |  |               |                       |
| 4                          |                    |                   |                |                                 |                 |          |  |               |                       |
| 5                          |                    | -5'               |                |                                 |                 | CL       | <u>LEAN CLAY (CL) (5'-14.5')</u><br>Dry, gray with Red mottling, mottling changes to Brown @ 7' 8 1/2, then black @ 7.5' B.S. Fine grain, mostly clay some silt, medium plasticity, very stiff |               |                       |
| 6                          |                    |                   |                |                                 |                 |          |  |               |                       |
| 7                          |                    |                   | 2              | 100%                            |                 |          |  |               |                       |
| 8                          |                    |                   |                |                                 |                 |          |  |               |                       |
| 9                          |                    |                   |                |                                 |                 |          |  |               |                       |
| 10                         |                    |                   |                |                                 |                 |          |  |               |                       |
| 11                         |                    |                   |                |                                 |                 | CL       | <u>SAME AS ABOVE</u><br>no mottling, homotexture and water-shedding @ 13' B.S.   |               |                       |
| 12                         |                    |                   |                |                                 |                 |          |  |               |                       |
| 13                         |                    |                   | 3              | 100%                            |                 | FC<br>FC |  |               |                       |
| 14                         |                    | 14.5'             |                |                                 |                 |          |  |               |                       |
| 15                         |                    |                   |                |                                 |                 | SP       | <u>Poorly Grained Sand with Silt (SP) (14.5'-21.5')</u><br>Dry to moist, gray to brown, fine grain, mostly fine sand, little silt, non-plastic   |               |                       |
| 16                         |                    |                   |                |                                 |                 |          |  |               |                       |
| 17                         |                    |                   |                |                                 |                 |          |  |               |                       |
| 18                         |                    |                   | 4              |                                 |                 |          | <u>SAME AS ABOVE</u><br><u>inside</u>  |               |                       |
| 19                         |                    |                   |                |                                 |                 |          |  |               |                       |
| 20                         |                    |                   |                |                                 |                 |          |  |               |                       |

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by

Date:

50NW15

|  |                    |                    |                |  |                 |          |  |  |
|--|--------------------|--------------------|----------------|--|-----------------|----------|--|--|
| <b>AECOM</b><br>Client: <u>USACE</u><br>Project Number: <u>5-1a 50</u><br>Site Location: <u>5-1a 50</u><br>Coordinates: <u>DPT</u><br>Drilling Method: <u>DPT</u><br>Sample Type(s): <u>Boring Diameter:</u><br>Weather: <u>Sunny Pt.</u><br>Drilling Contractor: <u>Fugro</u> |                    |                    |                | Boring ID: <u>SDPT-14</u><br><u>SDPT-14</u><br>Sheet: <u>2 of 2</u><br>Monitoring Well Installed:<br>Screened Interval:<br>Depth of Boring:<br>Water Level:        |                 |          |  |  |
|  |                    |                    |                | Logged By: <u>M. Lewis</u><br>Date/Time Started:<br>Date/Time Finished:<br>Ground Elevation:   |                 |          |  |  |
|  |                    |                    |                | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |                 |          |  |  |
|  |                    |                    |                | Lab Sample ID  | Depth (ft.)     |          |  |  |
| Depth (ft.)  | Geologic sample ID | Sample Depth (ft.) | Blows per foot | Recovery (inches)  | Headspace (ppm) | U.S.C.S. | 21<br>22<br>23<br>24<br>25<br>26<br>27<br>28<br>29<br>30<br>31<br>32<br>33<br>34<br>35<br>36<br>37<br>38<br>39<br>40   |  |
|  |                    | 21.5'-23'          | 5              | 75%  |                 | SP       | POORLY GRAINED SAND WITH SILT (SP) (14.5-22.5)<br>moist to damp, grayish brown, mostly fine sand, little silt, non-plastic.  |  |
|  |                    |                    |                |  |                 | EL       | LEAN CLAY (CL) (22.5'-23')<br>moist, purplish gray, mostly clay, few silt, trace mica, low plasticity.   |  |
|  |                    |                    |                |  |                 | SP       | POORLY GRAINED SAND WITH SILT (SP) (23-25)<br>moist, brown brown, mostly fine sand, little silt, trace mica, non-plastic.  |  |
|  |                    |                    |                | 100%   |                 | SP       | End of Soil Boring @ 25' Plus<br>POORLY GRAINED SAND WITH SILT (SP) (25-30)<br>wet to moist, base, dark yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, iron oxide staining between 27-29 ft. |  |
|  |                    |                    |                | 95%  |                 |          | SAME AS ABOVE<br>32-32.4 ft iron oxide staining with cementation, moist<br>At 35 ft thin clay stringers ~3 ft.   |  |
|  |                    |                    |                |  |                 |          | End of Boring at 35'<br>SAME AS ABOVE<br>35.5-36.2 Cemented sand, iron oxide?<br>Black in color, moist<br><del>37-40</del> 37-40 termination of silt<br>-Color change at 40 ft to dark gray                            |  |

NOTES: Hydropunch Sampler Screen Interval: 26'-30' Bgs

Checked by

Date:

50 WNW 16

| AECOM      |                    |                   |            | Client: USACE                            |                 |      |  | Project Number: 60256135         |            |  |  | Boring ID: 50 DPT-5            |  |  |  |
|------------|--------------------|-------------------|------------|--|-----------------|------|--|----------------------------------|------------|--|--|--------------------------------|--|--|--|
|            |                    |                   |            | Site Location: Site 50                   |                 |      |  | Elevation:                       |            |  |  | Sheet: 1 of 2                  |  |  |  |
|            |                    |                   |            | Coordinates:                             |                 |      |  | Drilling Method: DPT / HSA       |            |  |  | Monitoring Well Installed: Yes |  |  |  |
|            |                    |                   |            | Sample Type(s): Muds from Mills Borehole |                 |      |  | Boring Diameter: 2' 6"           |            |  |  | Screened Interval: 20'-35'     |  |  |  |
|            |                    |                   |            | Logged By: M. Low                        |                 |      |  | Date/Time Started: 7/26/12 0845  |            |  |  | Depth of Boring: 35' / 35'     |  |  |  |
|            |                    |                   |            | Ground Elevation:                        |                 |      |  | Date/Time Finished: 7/26/12 0846 |            |  |  | Water Level: 18.5'             |  |  |  |
| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Blow Count | Recovery (%)                             | Headspace (ppm) | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) | Lab Sample ID                    | Depth (ft) |  |  |                                |  |  |  |
| 0'         |                    | 0'                |            |  |                 | CL   | LEAN CLAY (CL) (6'-9.5')   |                                  |            |  |  |                                |  |  |  |
| 1          |                    |                   |            |  |                 | SP   | Very dark grayish brown, muddy clay, few silt, low plasticity.   |                                  |            |  |  |                                |  |  |  |
| 2          |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 3          |                    |                   |            |  |                 |      | POORLY GRAINED SAND WITH SILT (SP) (9.5' - 14.5')  |                                  |            |  |  |                                |  |  |  |
| 4          |                    |                   |            |  |                 |      | Dry to moist, dark yellowish brown, mostly fine sand, little silt, nonplastic, trace black sandstone   |                                  |            |  |  |                                |  |  |  |
| 5          |                    |                   |            |  |                 | CL   | LEAN CLAY (CL) (14.5' - 5')  |                                  |            |  |  |                                |  |  |  |
| 6          |                    |                   |            |  |                 | SP   | Dry, dark grayish brown with blackish brown mottles, fine to trace fine sand, medium plasticity  |                                  |            |  |  |                                |  |  |  |
| 7          |                    |                   |            |  |                 |      | POORLY GRAINED SAND WITH SILT (SP) (5' - 9.5')   |                                  |            |  |  |                                |  |  |  |
| 8          |                    |                   |            |  |                 |      | Dry to moist, yellow, mostly fine sand, little silt, nonplastic,   |                                  |            |  |  |                                |  |  |  |
| 9          |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 10         |                    |                   |            |  |                 | CL   | LEAN CLAY (CL) (9.5' - 10.5')  |                                  |            |  |  |                                |  |  |  |
| 11         |                    |                   |            |  |                 | SP   | Dry, light gray with brown mottles, few fine sand, low plasticity.   |                                  |            |  |  |                                |  |  |  |
| 12         |                    |                   |            |  |                 |      | POORLY GRAINED SAND WITH SILT (SP) (10.5' - 20')   |                                  |            |  |  |                                |  |  |  |
| 13         |                    |                   |            |  |                 |      | Dry to moist, light gray to yellowish brown, mostly fine sand, little silt, trace mica, non-plastic  |                                  |            |  |  |                                |  |  |  |
| 14         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 15         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 16         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 17         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 18         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 19         |                    |                   |            |  |                 |      |  |                                  |            |  |  |                                |  |  |  |
| 20         |                    |                   |            |  |                 |      | SAME AS ABOVE  |                                  |            |  |  |                                |  |  |  |

NOTES:

Date Time Depth to groundwater while drilling

Checked by

Date:

C-30

50XW16

| AECOM                          |                    |                   |              |                   |                 | Client: <u>USACE</u>          |  | BORING ID: <u>500PT-5</u><br><u>-SOUTH</u> |                       |
|--------------------------------|--------------------|-------------------|--------------|-------------------|-----------------|-------------------------------|--|--|-----------------------|
| Project Number: <u>Site 50</u> |                    |                   |              |                   |                 | Site Location: <u>Site 50</u> |  | Elevation:                                 |                       |
| Coordinates:                   |                    |                   |              |                   |                 | Coordinates:                  |  | Sheet: <u>2 of 2</u>                       |                       |
| Drilling Method:               |                    |                   |              |                   |                 | Drilling Method:              |  | Monitoring Well Installed: <u>Yes</u>      |                       |
| Sample Type(s):                |                    |                   |              |                   |                 | Sample Type(s):               |  | Screened Interval: <u>20-35'</u>           |                       |
| Weather:                       |                    |                   |              |                   |                 | Weather:                      |  | Depth of Boring: <u>35'</u>                |                       |
| Drilling Contractor:           |                    |                   |              |                   |                 | Drilling Contractor:          |  | Water Level:                               |                       |
| Depth (ft)                     | Geologic sample ID | Sample Depth (ft) | Blows per 6" | Recovery (inches) | Headspace (ppm) | U.S.C.S.                      | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)   | Lab Sample ID                              | Lab Sample Depth (ft) |
| 21                             |                    | 20.5'             |              |                   |                 |                               |  |  |                       |
| 22                             |                    |                   | 5            | 91%               |                 | SP                            | <u>POORLY GRADED SAND (SP) (20-20.5)</u><br><u>Wet, greyish yellowish brown, mostly silt, little fine sand, silty plastic. The grey clay at top.</u>   |  |                       |
| 23                             |                    |                   |              |                   |                 |                               | <u>POORLY GRADED SAND with Silt (SP) (20.5-25)</u><br><u>Wet to moist, yellowish brown, mostly fine sand, little silt, non-plastic, sandstone fragment @ 24" (concretion?)</u>   |  |                       |
| 24                             |                    | 24'               |              |                   |                 |                               |  |  |                       |
| 25                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 26                             |                    |                   |              |                   |                 | SP                            | <u>End of Boring @ 25' Bore</u><br><u>POORLY GRADED SAND</u><br><u>WITH SILT (SP)</u><br><u>Wet to moist, yellowish brown, mottled fine sand, trace mica, non-plastic, silt banding throughout about 1/4" thick, medium density bear cemented sand from 27.5' to 28.5'.</u><br><u>Some organic streaking at 27 feet.</u><br><u>27.5 Color change to dark yellowish brown and silt banding stops.</u> |  |                       |
| 27                             |                    |                   | 6            | 100%              |                 |                               |  |  |                       |
| 28                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 29                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 30                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 31                             |                    |                   |              |                   |                 | SP                            | <u>POORLY GRADED SAND WITH SILT (SP)</u><br><u>Wet to moist, yellowish brown, mostly fine sand. Non-plastic, loose. Very little silt content. About 1.5 feet down when silt banding begins at about 1/8" thickness and 3/4" thickness of sandy silt.</u><br><u>End of boring @ 35 feet</u>   |  |                       |
| 32                             |                    |                   | 7            | 70%               |                 |                               |  |  |                       |
| 33                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 34                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 35                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 36                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 37                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 38                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 39                             |                    |                   |              |                   |                 |                               |  |  |                       |
| 40                             |                    |                   |              |                   |                 |                               |  |  |                       |

NOTES: Hydro pump set @ 26'-30' Bore

Checked by

Date:

C-31





| <b>A-Com</b><br>Client: GeSAGE<br>Project Number: G025C13 S<br>Site Location: State SO<br>Coordinates:<br>Drilling Method:<br>Sample Type(s):<br>Logged By:<br>Ground Elevation: |                    |                   |                |              |                 | <b>BORING ID: S0448</b><br><br>Sheet 2 of 4<br>Monitoring Well Installed:<br>Screened Interval:<br>Depth of Boring:<br>Water Level: |  |               |                       |
|--|--------------------|-------------------|----------------|--------------|-----------------|---|--|---------------|-----------------------|
| Weather:   |                    |                   |                |              |                 |   |  |               |                       |
| Drilling Contractor:   |                    |                   |                |              |                 |   |  |               |                       |
| Depth (ft)   | Geologic Sample ID | Sample Depth (ft) | Blows per ft # | Recovery (%) | Headspace (ppm) | U.S.C.S.  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)               | Lab Sample ID | Lab Sample Depth (ft) |
| 21   |                    |                   |                |              |                 | CL  | LEAN CLAY (CL)<br>Soft, dry, gray, much clay, few fine sand, low plasticity  |               |                       |
| 22   |                    | -22.5'-           | 5              | ~90%         |                 | ML  | SILT (ml) (22.5'-24')<br>Soft, dry, gray, mostly silt, trace clay, non-plastic laminated.  |               |                       |
| 23   |                    | -24'-             |                |              |                 | SP  | POODLY GRADUALLY SAND WITH SILT (SP) (24'-)<br>Medium dense, deep, yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, trace iron oxide staining @ 24' Hgt. |               |                       |
| 24   |                    |                   |                |              |                 | SP  | SAME AS ABOVE<br>Wet wet to moist @ 30'  |               |                       |
| 25   |                    |                   |                |              |                 | SP  | SAME AS ABOVE<br>wet to moist, pale brown  |               |                       |
| 26   |                    |                   |                |              |                 | SP  | Inn oxide staining @ 24' Hgt -   |               |                       |
| 27   |                    |                   |                |              |                 | SP  | - color change @ 36' gr. grey -  |               |                       |
| 28   |                    |                   |                |              |                 | SP  |  |               |                       |
| 29   |                    |                   |                |              |                 |   |  |               |                       |
| 30   |                    |                   |                |              |                 |   |  |               |                       |
| 31   |                    |                   |                |              |                 |   |  |               |                       |
| 32   |                    |                   |                |              |                 |   |  |               |                       |
| 33   |                    |                   |                |              |                 |   |  |               |                       |
| 34   |                    |                   |                |              |                 |   |  |               |                       |
| 35   |                    |                   |                |              |                 |   |  |               |                       |
| 36   |                    | -36'-             |                |              |                 |   |  |               |                       |
| 37   |                    |                   |                |              |                 |   |  |               |                       |
| 38   |                    |                   |                |              |                 |   |  |               |                       |
| 39   |                    |                   |                |              |                 |   |  |               |                       |
| 40   |                    |                   |                |              |                 |   |  |               |                       |

**NOTES:**

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_



50WW17

| <b>A=COM</b><br>Client:<br>Project Number:<br>Site Location:<br>Coordinates:<br>Drilling Method:<br>Sample Type(s): |                    | Boring ID: <del>50WW17</del> |                             |              |                 |         |  |                                     |                       |
|---|--------------------|------------------------------|-----------------------------|--------------|-----------------|---------|--|-------------------------------------|-----------------------|
|   |                    | Sheet 3 of 4                 |                             |              |                 |         |  |                                     |                       |
|   |                    | Monitoring Well Installed:   |                             |              |                 |         |  |                                     |                       |
|   |                    | Screened Interval:           |                             |              |                 |         |  |                                     |                       |
| Weather:  |                    | Depth of Boring:             |                             |              |                 |         |  |                                     |                       |
| Drilling Contractor:  |                    | Water Level:                 |                             |              |                 |         |  |                                     |                       |
| Logged By:  |                    | Date/Time Started:           |                             |              |                 |         |  |                                     |                       |
| Ground Elevation:   |                    | Date/Time Finished:          |                             |              |                 |         |  |                                     |                       |
| Depth (ft)  | Geologic Sample ID | Sample Depth (ft)            | <del>R<sub>u</sub>, #</del> | Recovery (%) | Headspace (ppm) | U.S.C.s | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID                       | Lab Sample Depth (ft) |
| 41  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 42  |                    |                              | 9                           | ~70%         |                 | SP      | POORLY GRAINED SAND WITH SILT (SP)<br>loose, wet, gray, mostly fine sand, 1.46 S.H.<br>trace mica, non-plastic   |                                     |                       |
| 43  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 44  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 45  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 46  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 47  |                    |                              | 10                          | ~50%         |                 |         | SAME AS ABOVE<br>medium dense,   |                                     |                       |
| 48  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 49  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 50  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 51  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 52  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 53  |                    |                              | 11                          | ~30%         |                 | SP      | SAME AS ABOVE<br>dense,  |                                     |                       |
| 54  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 55  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 56  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 57  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 58  |                    |                              | 12                          | ~30%         |                 |         | SAME AS ABOVE<br>medium dense, trace black organic banding.  |                                     |                       |
| 59  |                    |                              |                             |              |                 |         |  |                                     |                       |
| 60  |                    |                              |                             |              |                 |         |  |                                     |                       |
| NOTES:  |                    |                              |                             |              |                 |         |  |                                     |                       |
| Checked by: _____ Date: _____   |                    |                              |                             |              |                 | Date    | Time   | Depth to groundwater while drilling |                       |
|   |                    |                              |                             |              |                 |         |  |                                     |                       |
|   |                    |                              |                             |              |                 |         |  |                                     |                       |
|   |                    |                              |                             |              |                 |         |  |                                     |                       |
|   |                    |                              |                             |              |                 |         |  |                                     |                       |

00954149

50 WW17

| <b>A-2-COM</b><br>Client: <i>USACE</i><br>Project Number: <i>60256135</i><br>Site Location: <i>Site 5D</i><br>Coordinates: _____<br>Drilling Method: _____<br>Sample Type(s): _____<br>Logged By: _____<br>Ground Elevation: _____ |                    | BORING ID: <i>50WW17</i>   |                   |                 |          |  |               |                       |
|--|--------------------|----------------------------|-------------------|-----------------|----------|--|---------------|-----------------------|
|  |                    | Sheet 4 of 4               |                   |                 |          |  |               |                       |
|  |                    | Monitoring Well Installed: |                   |                 |          |  |               |                       |
|  |                    | Screened Interval:         |                   |                 |          |  |               |                       |
| Depth of Boring:   |                    | Water Level:               |                   |                 |          |  |               |                       |
| Weather:   |                    |                            |                   |                 |          |  |               |                       |
| Drilling Contractor:   |                    |                            |                   |                 |          |  |               |                       |
| Depth (ft)   | Geologic Sample ID | Sample Depth (ft)          | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 61   |                    |                            |                   |                 |          |  |               |                       |
| 62   |                    |                            |                   |                 |          |  |               |                       |
| 63   |                    |                            |                   |                 |          |  |               |                       |
| 64   |                    |                            |                   |                 |          |  |               |                       |
| 65   |                    |                            |                   |                 |          |  |               |                       |
| 66   |                    |                            |                   |                 |          |  |               |                       |
| 67   |                    |                            |                   |                 |          |  |               |                       |
| 68   |                    |                            |                   |                 |          |  |               |                       |
| 69   |                    |                            |                   |                 |          |  |               |                       |
| 70   |                    |                            |                   |                 |          |  |               |                       |
| 71   |                    |                            |                   |                 |          |  |               |                       |
| 72   |                    |                            |                   |                 |          |  |               |                       |
| 73   |                    |                            |                   |                 |          |  |               |                       |
| 74   |                    |                            |                   |                 |          |  |               |                       |
| 75   |                    |                            |                   |                 |          |  |               |                       |
| 76   |                    |                            |                   |                 |          |  |               |                       |
| 77   |                    |                            |                   |                 |          |  |               |                       |
| 78   |                    |                            |                   |                 |          |  |               |                       |
| 79   |                    |                            |                   |                 |          |  |               |                       |
| 80   |                    |                            |                   |                 |          |  |               |                       |
| NOTES:   |                    |                            |                   |                 |          |  |               |                       |
| Checked by: _____ Date: _____  |                    |                            |                   |                 |          |  |               |                       |

NOTES:

Date

Time

Depth to groundwater while drilling

00954150

| A-Com      |                    |                   |                  |              |                 | Client: USACE<br>Project Number: 60256135<br>Site Location: Site 5D<br>Coordinates: |  | Boring ID: 500004              |                       |
|------------|--------------------|-------------------|------------------|--------------|-----------------|---|--|--------------------------------|-----------------------|
|            |                    |                   |                  |              |                 | Drilling Method: HSA  |  | Sheet 1 of 2                   |                       |
|            |                    |                   |                  |              |                 | Sample Type(s): Muck Barrel   |  | Monitoring Well Installed: yes |                       |
|            |                    |                   |                  |              |                 | Logged By: M. Lew   |  | Screened Interval: 20'-25'     |                       |
|            |                    |                   |                  |              |                 | Ground Elevation:   |  | Depth of Boring: 35'           |                       |
|            |                    |                   |                  |              |                 | Weather: Sunny  |  | Water Level:                   |                       |
|            |                    |                   |                  |              |                 | Drilling Contractor: TSS  |  |                                |                       |
| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | R <sub>s</sub> # | Recovery (%) | Henderson (ppm) | U.S.C.S.  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)                   | Lab Sample ID                  | Lab Sample Depth (ft) |
| 1          |                    |                   |                  |              |                 | ML  | SILT (ML) (0-9')   |                                |                       |
| 2          |                    |                   |                  | ~50%         |                 |   | Silt, clay, brownish yellow, moist silt, few very fine sand, non-plastic, trace roots  |                                |                       |
| 3          |                    |                   |                  |              |                 |   |  |                                |                       |
| 4          |                    |                   |                  |              |                 |   |  |                                |                       |
| 5          |                    |                   |                  |              |                 |   |  |                                |                       |
| 6          |                    |                   |                  |              |                 |   |  |                                |                       |
| 7          |                    | -7'-              | 2                | ~80%         |                 |   | - Increasing sand content @ 7' bgs, little sand -  |                                |                       |
| 8          |                    |                   |                  |              |                 |   |  |                                |                       |
| 9          |                    | -9'-              |                  |              |                 | CL  | LEAN CLAY WITH SAND & SILT (CL) (9'-12')   |                                |                       |
| 10         |                    |                   |                  |              |                 |   | Silt, clay, light gray w/ thin mottles, mostly clay, little sand & silt, low plasticity.   |                                |                       |
| 11         |                    |                   |                  |              |                 | CL  | <u>SAME AS ABOVE</u>   |                                |                       |
| 12         |                    |                   |                  |              |                 |   | light shaly gray with thin & dark yellow horizontal banding, medium plasticity, trace silt, trace black speckling.   |                                |                       |
| 13         |                    |                   | 3                | ~100%        |                 | CL  |  |                                |                       |
| 14         |                    |                   |                  |              |                 |   |  |                                |                       |
| 15         |                    |                   |                  |              |                 |   |  |                                |                       |
| 16         |                    |                   |                  |              |                 |   |  |                                |                       |
| 17         |                    |                   |                  |              |                 |   |  |                                |                       |
| 18         |                    | -18'-             | 4                | ~100%        |                 | SP  | POORLY GRAINED SAND WITH SILT (SP)<br>loose, moist, very fine sand, mostly fine sand, little silt, non-plastic, trace mica, iron oxide staining & concentrations @ 18' & 17.5' bgs - |                                |                       |
| 19         |                    |                   |                  |              |                 |   |  |                                |                       |
| 20         |                    |                   |                  |              |                 |   |  |                                |                       |

**NOTES:**

Depth to groundwater while drilling

Date \_\_\_\_\_ Time \_\_\_\_\_

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

50WW18

| <b>A=COM</b><br>Client: <u>USACE</u><br>Project Number: <u>60256135</u><br>Site Location: <u>Six 50</u><br>Coordinates: <u>Elevation</u><br>Drilling Method:<br>Sample Type(s):<br>Logged By:<br>Ground Elevation: |                    | BORING ID: <u>50WW18</u><br>Sheet 2 of 2<br>Monitoring Well Installed:<br>Screened Interval:<br>Depth of Boring:<br>Water Level:                                   |                   |                   |                 |         |  |               |                       |
|--|--------------------|--|-------------------|-------------------|-----------------|---------|--|---------------|-----------------------|
|  |                    | Weather:<br>Drilling Contractor:   |                   |                   |                 |         |  |               |                       |
|  |                    | Boring Diameter:<br>Date/Time Started:<br>Date/Time Finished:  |                   |                   |                 |         |  |               |                       |
|  |                    | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |                   |                   |                 |         |  |               |                       |
| Depth (ft)   | Geologic Sample ID | Sample Depth (ft)  | R <sub>50</sub> # | Recovery (ft/lbs) | Headspace (ppm) | U.S.C.s |  | Lab Sample ID | Lab Sample Depth (ft) |
| 21   |                    |  |                   |                   |                 | SP      |  |               |                       |
| 22   |                    |  | 5                 | ~ 100%            |                 |         |  |               |                       |
| 23   |                    |  |                   |                   |                 |         |  |               |                       |
| 24   |                    |  |                   |                   |                 |         |  |               |                       |
| 25   |                    |  |                   |                   |                 |         |  |               |                       |
| 26   |                    |  |                   |                   |                 |         |  |               |                       |
| 27   |                    |  | 6                 | ~ 100%            |                 |         |  |               |                       |
| 28   |                    |  |                   |                   |                 |         |  |               |                       |
| 29   |                    |  |                   |                   |                 |         |  |               |                       |
| 30   |                    |  |                   |                   |                 |         |  |               |                       |
| 31   |                    |  |                   |                   |                 | SP      |  |               |                       |
| 32   |                    |  |                   |                   |                 |         |  |               |                       |
| 33   |                    |  | 7                 | ~ 70%             |                 |         |  |               |                       |
| 34   |                    |  |                   |                   |                 |         |  |               |                       |
| 35   |                    |  |                   |                   |                 |         |  |               |                       |
| 36   |                    |  |                   |                   |                 |         |  |               |                       |
| 37   |                    |  |                   |                   |                 |         |  |               |                       |
| 38   |                    |  |                   |                   |                 |         |  |               |                       |
| 39   |                    |  |                   |                   |                 |         |  |               |                       |
| 40   |                    |  |                   |                   |                 |         |  |               |                       |
| NOTES:   |                    |  |                   |                   |                 |         |  |               |                       |
| Date: _____ Time: _____ Depth to groundwater while drilling: _____   |                    |  |                   |                   |                 |         |  |               |                       |
| Checked by: _____ Date: _____  |                    |  |                   |                   |                 |         |  |               |                       |

00954152

# AECOM

Client: **USACE**

Project Number: **60256135**

Site Location: **S4C S0**

Coordinates: **DPT/THSA**

Drilling Method: **Micro Core / Miller Bore**

Sample Type(s): **Geo/TS**

BORING ID: **S0BPT-19**

Sheet: **1 of 4**

Monitoring Well Installed: **Yes**

Screened Interval: **50' / 65'**

Weather: **Sunny 88°**

Drilling Contractor: **Fugro/TS**

Elevation: **101.34**

Boring Diameter: **3" / 5"**

Date/Time Started: **7/23/12 1425**

Date/Time Finished: **7/23/12 1100**

Water Level: **50' / 65'**

Logged By: **M. Law**

Ground Elevation: **101.34**

| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Recovery (inches) | Headspace (ppm) | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|-------------------|-----------------|------|--|---------------|-----------------------|
| 1          |                    |                   |                   |                 |      |  |               |                       |
| 2          |                    |                   |                   |                 |      |  |               |                       |
| 3          |                    |                   |                   |                 |      |  |               |                       |
| 4          |                    |                   |                   |                 |      |  |               |                       |
| 5          |                    |                   |                   |                 |      |  |               |                       |
| 6          |                    |                   |                   |                 |      |  |               |                       |
| 7          |                    |                   |                   |                 |      |  |               |                       |
| 8          |                    |                   |                   |                 |      |  |               |                       |
| 9          |                    |                   |                   |                 |      |  |               |                       |
| 10         |                    |                   |                   |                 |      |  |               |                       |
| 11         |                    |                   |                   |                 |      |  |               |                       |
| 12         |                    |                   |                   |                 |      |  |               |                       |
| 13         |                    |                   |                   |                 |      |  |               |                       |
| 14         |                    |                   |                   |                 |      |  |               |                       |
| 15         |                    |                   |                   |                 |      |  |               |                       |
| 16         |                    |                   |                   |                 |      |  |               |                       |
| 17         |                    |                   |                   |                 |      |  |               |                       |
| 18         |                    |                   |                   |                 |      |  |               |                       |
| 19         |                    |                   |                   |                 |      |  |               |                       |
| 20         |                    |                   |                   |                 |      |  |               |                       |

Notes:

1. **LEARNER (CL) (6-4.5')**  
 Dry, strong brown, mostly clay. Few silt, lumping soft

2. **JANES (CL) (4-4.5')**  
 yellowish red to dark yellowish brown  
 - increasing sand content -  
 - mostly calcareous sand with silt (SP) (4.5')  
 - brown, mostly fine sand, little silt, black speckling, non-plastic  
 - becomes clump @ 7' @ 5' -

3. **LEARNER (CL) (4-4.5')**  
 mostly light gray with (6) (4-4.5') brown, mostly clay  
 few fine sand, medium plasticity, very stiff.  
 - 3" fine sand lenses @ 9.75' @ 5' -  
 - interbedding with sand @ 11' @ 5' -

4. **NR**  
 No Recovery  
 - broken notes, harder drilling -  
 - 50' from top -

**AECOM**

Client: **USACE**  
 Project Number:  
 Site Location: **Sta 50**  
 Coordinates:  
 Drilling Method:  
 Sample Type(s):

**50W19**

BORING ID: **SOBPT-10/**  
**50W19**

Elevation:

Sheet: **2 of 4**

Monitoring Well Installed:

Screened Interval:

Logged By:

Boring Diameter:

Date/Time Started:

Date/Time Finished:

Ground Elevation:

Depth of Boring:

Water Level:

Weather:

Drilling Contractor:

| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Flow per ft | Recovery (%) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)                                 | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|-------------|--------------|-----------------|----------|--|---------------|-----------------------|
| 21         |                    |                   |             |              |                 |          |  |               |                       |
| 22         |                    | 21'-              | 5           | ~60%         |                 | CL       | <u>LEAN CLAY (CL)</u> (20'-21')<br>dry to moist, gray, few brown mottles, very stiff, medium plasticity  |               |                       |
| 23         |                    |                   |             |              |                 | SP       | <u>POORLY GRAINED SAND WITH SILT (SP)</u> (21'-23')<br>moist, yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, trace bands of gray clay                                    |               |                       |
| 24         |                    |                   |             |              |                 |          |  |               |                       |
| 25         |                    |                   |             |              |                 |          |  |               |                       |
| 26         |                    | 26.25'            | 6           | ~80%         |                 |          | - iron staining and cementation @ 26.25' Bgs -   |               |                       |
| 27         |                    | 27.5'             |             |              |                 |          |  |               |                       |
| 28         |                    | 28.5'             | 7           | ~100%        |                 | CL/SP    | <u>INTERBEDDED LEAN CLAY &amp; POORLY GRAINED SAND WITH SILT (SP)</u> (27.5' - 28.5')<br>moist, light bluish/greenish gray clay, medium to low plasticity with light brown, fine sand, trace mica. |               |                       |
| 29         |                    |                   |             |              |                 | SP       | <u>POORLY GRAINED SAND WITH SILT (SP)</u> (28.5' - 29.25')<br>wet to moist, yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, medium dense.                                 |               |                       |
| 30         |                    |                   |             |              |                 |          |  |               |                       |
| 31         |                    |                   |             |              |                 |          |  |               |                       |
| 32         |                    |                   | 8           | ~60%         |                 |          | <u>SAME AS ABOVE</u><br>denser, yellowish brown, iron staining @ 31.5' Bgs   |               |                       |
| 33         |                    |                   |             |              |                 |          |  |               |                       |
| 34         |                    |                   |             |              |                 |          |  |               |                       |
| 35         |                    |                   |             |              |                 |          |  |               |                       |
| 36         |                    |                   | 9           | ~60%         |                 |          |  |               |                       |
| 37         |                    |                   |             |              |                 |          |  |               |                       |
| 38         |                    |                   |             |              |                 |          |  |               |                       |
| 39         |                    | 39.25'            | 10          | ~50%         |                 | SP       | <u>SAME AS ABOVE</u> , <u>SAR</u> , gray, trace black banding, trace clay  |               |                       |
| 40         |                    |                   |             |              |                 |          |  |               |                       |

NOTES: Hydro punch screen interval sat @ 26'-30' Bgs

Date

Time

Depth to groundwater while drilling

Checked by

Date

| AECOM                          |                    |                   |               | Client: <u>USACE</u> |                 |      |  | BORING ID: <u>50WV19</u>   |            |  |  |
|--------------------------------|--------------------|-------------------|---------------|----------------------|-----------------|------|--|----------------------------|------------|--|--|
| Project Number: <u>Site 50</u> |                    |                   |               | Sheet: <u>004</u>    |                 |      |  | Monitoring Well Installed: |            |  |  |
| Coordinates: <u>Site 50</u>    |                    |                   |               | Elevation:           |                 |      |  | Screened Interval:         |            |  |  |
| Drilling Method:               |                    |                   |               | Boring Diameter:     |                 |      |  | Depth of Boring:           |            |  |  |
| Sample Type(s):                |                    |                   |               | Logged By:           |                 |      |  | Water Level:               |            |  |  |
| Weather:                       |                    |                   |               | Ground Elevation:    |                 |      |  | Date/Time Started:         |            |  |  |
| Drilling Contractor:           |                    |                   |               | Date/Time Finished:  |                 |      |  | Lab Sample ID              |            |  |  |
| Depth (ft)                     | Geologic sample ID | Sample Depth (ft) | Recovery (ft) | USCS                 | Headspace (ppm) | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)   | Lab Sample ID              | Depth (ft) |  |  |
| 41                             |                    |                   |               |                      |                 |      | <u>POORLY SORTED SAND WITH SILT (SP)</u><br>damp to moist with depth, dark gray, mostly fine sand,<br>little silt, trace clay, non-plastic, trace mica.<br><br><u>SAME AS ABOVE</u><br><br>- Black branching organics & Fe-lignite fragments.<br>@ 46' Bgs - |                            |            |  |  |
| 42                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 43                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 44                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 45                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 46                             |                    | 44'-              |               |                      |                 |      |  |                            |            |  |  |
| 47                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 48                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 49                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 50                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 51                             |                    |                   |               | SP                   |                 |      | <u>End of Run @ 50' Bgs</u><br><u>SAME AS ABOVE</u><br>wet to moist, dry, mostly fine sand, little silt,<br>trace mica.<br>- Black organics & lignite @ 52' Bgs -  |                            |            |  |  |
| 52                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 53                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 54                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 55                             |                    | 54'-              |               |                      |                 |      | - Increasing clay content below 54.5' Bgs -<br>silty, slightly plastic.<br><u>SAME AS ABOVE</u>  |                            |            |  |  |
| 56                             |                    |                   |               | SP                   |                 |      |  |                            |            |  |  |
| 57                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 58                             |                    |                   |               |                      |                 |      | - Organics @ 56.5' Bgs thin bands  |                            |            |  |  |
| 59                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |
| 60                             |                    |                   |               |                      |                 |      |  |                            |            |  |  |

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by

Date:

| <div style="font-size: 2em; font-weight: bold; margin-bottom: 10px;">A=COM</div> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Client:</b> CCSAC/E</p> <p><b>Project Number:</b> C0856735</p> <p><b>Site Location:</b> Site SO</p> <p><b>Coordinates:</b></p> <p><b>Elevation</b></p> </div> <div style="width: 45%;"> <p><b>BORING ID:</b> SO DPT-10 / <del>SO DPT-2</del></p> <p><b>Sheet</b> 4 of 4</p> <p><b>Monitoring Well Installed:</b></p> <p><b>Screens Interval:</b></p> <p><b>Depth of Boring:</b></p> <p><b>Water Level:</b></p> </div> </div> |                    |                   |              |                     |                 |          |  |               |                       |  |  |
|--|--------------------|-------------------|--------------|---------------------|-----------------|----------|--|---------------|-----------------------|--|--|
| <b>Weather:</b><br><b>Drilling Contractor:</b>   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| <b>Sample Type(s):</b> Milk Barrel<br><b>Logged By:</b> M. Lee<br><b>Ground Elevation:</b>   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| <b>Drilling Method:</b> HSA<br><b>Boring Diameter:</b><br><b>Date/Time Started:</b><br><b>Date/Time Finished:</b>  |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| Depth (ft)   | Geologic Sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches) % | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)                                 | Lab Sample ID | Lab Sample Depth (ft) |  |  |
| 61   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 62   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 63   |                    |                   | 16           | n-sa%               |                 | SP       | POORLY GRADED SAND WITH SILT (SP)<br><del>Blue, moist, grey, mostly fine sand, little silt,</del><br>trace #Mica, min-p-lvsic, trace sand filled<br>Borehole @ 62.5' Bgs, Fill sand is pale brown. |               |                       |  |  |
| 64   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 65   |                    |                   |              |                     |                 |          | End of Boring @ 65' Bgs  |               |                       |  |  |
| 66   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 67   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 68   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 69   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 70   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 71   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 72   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 73   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 74   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 75   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 76   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 77   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 78   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 79   |                    |                   |              |                     |                 |          |  |               |                       |  |  |
| 80   |                    |                   |              |                     |                 |          |  |               |                       |  |  |

**NOTES:**

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_



50NW20

| AECOM                             |                    |                   |           | Client: <u>USACE</u>   |                 |      |  | Project Number: <u>60255735</u>   |             |  |  | Boring ID: <u>50NW20</u>             |  |  |  |
|-----------------------------------|--------------------|-------------------|-----------|--|-----------------|------|--|-----------------------------------|-------------|--|--|--------------------------------------|--|--|--|
| Weather: <u>Cloudy 77</u>         |                    |                   |           | Site Location: <u>St. Louis</u>  |                 |      |  | Coordinates: <u>54E 50</u>        |             |  |  | Sheet: 1 of 3                        |  |  |  |
| Drilling Contractor: <u>Fugro</u> |                    |                   |           | Drilling Method: <u>DPT</u>  |                 |      |  | Sample Type(s): <u>Macro Core</u> |             |  |  | Monitoring Well Installed: <u>NO</u> |  |  |  |
| Sample Type(s): <u>Macro Core</u> |                    |                   |           | Boring Diameter: <u>2"</u>   |                 |      |  | Screened Interval: <u>10'</u>     |             |  |  | Depth of Boring: <u>35'</u>          |  |  |  |
| Logged By: <u>M. L. W.</u>        |                    |                   |           | Date/Time Started: <u>7/24/13 08:30</u>  |                 |      |  | Date/Time Finished: <u>22:40</u>  |             |  |  | Water Level: <u>22.40</u>            |  |  |  |
| Ground Elevation:                 |                    |                   |           | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |                 |      |  | Lab Sample ID                     |             |  |  | Depth (ft.)                          |  |  |  |
| 1                                 | Geologic sample ID | Sample Depth (ft) | Blowcount | Recovery (inches)  | Headspace (ppm) | USCS | <p>~0.25'</p> <p>ML SILT (ML) (0-0.25')</p> <p>Gray, Brown, moist silt, fine clay, non-plastic</p> <p>CL</p>   | Lab Sample ID                     | Depth (ft.) |  |  |                                      |  |  |  |
| 2                                 |                    |                   | 1         | ~90%   |                 |      | <p>LEAN CLAY (CL) (0.25' - 7')</p> <p>Gray, gray with red to brown mottles with depth, moist clay, medium plasticity, very stiff below 1.5'</p>            |                                   |             |  |  |                                      |  |  |  |
| 3                                 |                    |                   | 2         | ~100%  |                 |      | <p>SP</p> <p>POORLY GRAINED SAND (SP) (7' - 7.75')</p> <p>fine sand, white mottles, soft</p>   |                                   |             |  |  |                                      |  |  |  |
| 4                                 |                    |                   | 3         | ~100%  |                 |      | <p>CL</p> <p>POORLY GRAINED SAND (CL) (7.75' - 15.5')</p> <p>gray to yellow, moist fine sand, non-plastic</p>  |                                   |             |  |  |                                      |  |  |  |
| 5                                 |                    |                   | 4         | ~70%   |                 |      | <p>SP</p> <p>POORLY GRAINED SAND WITH SILT (SP) (15.5' - 16.5')</p> <p>gray to white, yellowish gray, moist sand, little silt, fine grain, non-plastic</p> |                                   |             |  |  |                                      |  |  |  |
| 6                                 |                    |                   | 5         |  |                 |      | <p>CL</p> <p>LEAN CLAY WITH SAND (CL) (16.5' - 19')</p> <p>as above</p>  |                                   |             |  |  |                                      |  |  |  |
| 7                                 |                    |                   | 6         |  |                 |      | <p>SP</p> <p>POORLY GRAINED SAND WITH SILT (SP) (19' - 20')</p> <p>moist, yellowish brown, moist fine sand, little silt, non-plastic</p>                   |                                   |             |  |  |                                      |  |  |  |

NOTES:

Date Time Depth to groundwater while drilling

Checked by

Date

50NN20

| AECOM                     |                    | Client: USACE  |              | Boring ID: 50NN20          |                 |      |
|---------------------------|--------------------|--|--------------|----------------------------|-----------------|------|
| Project Number:           |                    | Site Location: S-4L 50   |              | Sheet: 2 of 3              |                 |      |
| Coordinates:              |                    | Elevation:   |              | Monitoring Well Installed: |                 |      |
| Drilling Method: DPT      |                    | Boring Diameter:   |              | Screened Interval:         |                 |      |
| Sample Type(s):           |                    | Date/Time Started:   |              | Depth of Boring:           |                 |      |
| Weather: Sunny 77         |                    | Date/Time Finished:  |              | Water Level:               |                 |      |
| Drilling Contractor: Faye |                    | Logged By: M. Law  |              | Lab Sample ID              |                 |      |
| Ground Elevation:         |                    | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |              | Lab Sample (FL)            |                 |      |
| Depth (ft)                | Geologic sample ID | Sample Depth (ft)  | Blows per 6" | Recovery (inches)          | Headspace (ppm) | USCS |
| 21                        |                    |  |              |                            |                 | SP   |
| 22                        |                    | 22'-   | 5            | 75'                        |                 | Fe   |
| 23                        |                    |  |              |                            |                 | Fe   |
| 24                        |                    | 24'-   |              |                            |                 |      |
| 25                        |                    |  |              |                            |                 |      |
| 26                        |                    |  |              |                            |                 |      |
| 27                        |                    |  | 6            | 60%                        |                 |      |
| 28                        |                    |  |              |                            |                 |      |
| 29                        |                    |  |              |                            |                 |      |
| 30                        |                    | 29'-   |              |                            |                 | CL   |
| 31                        |                    |  |              |                            |                 | Fe   |
| 32                        |                    |  | 7            | 100%                       |                 | SP   |
| 33                        |                    |  |              |                            |                 | Fe   |
| 34                        |                    |  |              |                            |                 | Fe   |
| 35                        |                    |  |              |                            |                 |      |
| 36                        |                    |  |              |                            |                 |      |
| 37                        |                    |  | 8            | 60%                        |                 | SP   |
| 38                        |                    |  |              |                            |                 |      |
| 39                        |                    |  |              |                            |                 |      |
| 40                        |                    |  |              |                            |                 |      |

21-24' POORLY GRADED SAND with SILT (SP) (19'-24')  
 moist, black reddish brown, mostly sand, little silt  
 fine-grain, nonplastic, hematite concentration  
 22' + 24' Dye, few mica  
 - color changes back to yellowish gray below 24' Dye -  
 SAME AS ABOVE  
 moist light brown gray gummy to reddish brown from 28' Dye  
 LEAN CLAY (CL) (29'-30')  
 moist, soft, gray, mostly clay, some fine sand at  
 hematite concentration above & below clay layer.  
 POORLY GRADED SAND with SILT (SP) (30'-31.5')  
 damp, brownish gray, nonplastic, little silt, fine  
 clay, slightly plastic.  
 SAME AS ABOVE  
 moist, brownish gray, mostly sand, little silt, nonplastic  
 fine-grain, fine hematite concentration from 33' to 34.5' Dye  
 SAME AS ABOVE  
 same mica, yellowish brown with few gray hematite

NOTES: Hydro punch sampler @ 30'-34' (first water)  
 Checked by \_\_\_\_\_ Date: \_\_\_\_\_  
 Depth to groundwater while drilling

50W/W20

| AECOM                |                    |                   |              | Client: USACE          |                 | BORING ID: 50W/W20         |  |               |                       |
|----------------------|--------------------|-------------------|--------------|------------------------|-----------------|----------------------------|--|---------------|-----------------------|
| Project Number:      |                    |                   |              | Site Location: Site 50 |                 | BORING ID: 50W/W20         |  |               |                       |
| Coordinates:         |                    |                   |              | Elevation:             |                 | Sheet: 3 of 3              |  |               |                       |
| Drilling Method:     |                    |                   |              | Boring Diameter: 2"    |                 | Monitoring Well Installed: |  |               |                       |
| Sample Type(s):      |                    |                   |              | Date/Time Started:     |                 | Depth of Boring:           |  |               |                       |
| Weather:             |                    |                   |              | Date/Time Finished:    |                 | Water Level:               |  |               |                       |
| Drilling Contractor: |                    |                   |              | Logged By: M. Law      |                 |                            |  |               |                       |
| Ground Elevation:    |                    |                   |              | Date/Time Started:     |                 | Date/Time Finished:        |  |               |                       |
| Depth (ft)           | Geologic sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches)      | Headspace (ppm) | U.S.C.S.                   | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 40                   |                    |                   |              |                        |                 | SP?                        | POORLY GRADED SAND WITH SILT (SP)  |               |                       |
| 41                   |                    |                   |              |                        |                 |                            | Wet to moist, yellowish brown, mostly silt, little sand, a gradist down to yellowish brown @ 45' BGS   |               |                       |
| 42                   |                    |                   | 9            | 5%                     |                 | NR                         | - descripter from top at bottom of core -  |               |                       |
| 43                   |                    |                   |              |                        |                 |                            | - hard drilling @ ~ 43' BGS  |               |                       |
| 44                   |                    |                   |              |                        |                 |                            |  |               |                       |
| 45                   |                    | 45'               |              |                        |                 | SP?                        |  |               |                       |
| 46                   |                    |                   |              |                        |                 | SP                         | SAME AS ABOVE  |               |                       |
| 47                   |                    | 47'               | 10           | ~100%                  |                 | Fe Fe                      | - iron concentration nodules @ 47' (hematite?)   |               |                       |
| 48                   |                    |                   |              |                        |                 |                            | SAME AS ABOVE  |               |                       |
| 49                   |                    | 49'               | 11           | ~100%                  |                 | SP                         | POORLY GRADED SAND (SP) (49-52') WITH SILT, moist, grey, mostly fine sand, few silt, trace mica, non-plastic, few black bands in laminations, wet behavior         |               |                       |
| 50                   |                    |                   |              |                        |                 |                            |  |               |                       |
| 51                   |                    | 51.5'             |              |                        |                 |                            | - Black laminae @ 51.5' & 52.0' (Lignite?)   |               |                       |
| 52                   |                    | 52.5'             |              |                        |                 |                            | - Increasing clay content -  |               |                       |
| 53                   |                    | 53'               | 12           | 70%                    |                 | CL                         | LEAN CLAY (CL)   |               |                       |
| 54                   |                    |                   |              |                        |                 |                            | Dry, Dark Grey, moist clay, trace mica, low plasticity, very stiff   |               |                       |
| 55                   |                    | 55'               |              |                        |                 | SP?                        | - thin grey, fine sand lenses @ 54.5' BGS -  |               |                       |
| 56                   |                    |                   |              |                        |                 | CL                         | Interbedded LEAN CLAY (CL) and POORLY GRADED SAND WITH SILT (SP)   |               |                       |
| 57                   |                    |                   |              |                        |                 |                            | Dry, Dark Grey, moist clay, some fine sand interbeds, around 2" thick, medium plasticity, very stiff   |               |                       |
| 58                   |                    |                   | 13           | 70%                    |                 |                            | - continued hard drilling -  |               |                       |
| 59                   |                    |                   |              |                        |                 |                            |  |               |                       |
| 60                   |                    |                   |              |                        |                 |                            | End of Boring @ 60' BGS  |               |                       |

NOTES:

Date

Time

Depth to groundwater while drilling

Checked by

Date:

| AECOM                            |                    |                   |                | Client: <u>USACE</u>                      |                 |          |  | BORING ID: <u>50 W W 21</u>             |                       |  |  |
|----------------------------------|--------------------|-------------------|----------------|---|-----------------|----------|--|---|-----------------------|--|--|
| Project Number: <u>60356135</u>  |                    |                   |                | Elevation:                                |                 |          |  | Sheet: <u>1 of 2</u>                    |                       |  |  |
| Site Location: <u>Site 50</u>    |                    |                   |                | Boring Diameter: <u>8"</u>                |                 |          |  | Monitoring Well Installed: <u>YES</u>   |                       |  |  |
| Coordinates:                     |                    |                   |                | Sample Type(s): <u>MILL'S Core barrel</u> |                 |          |  | Screened Interval: <u>20-25 / 45-60</u> |                       |  |  |
| Drilling Method: <u>HSA</u>      |                    |                   |                | Logged By: <u>M. L. L. W.</u>             |                 |          |  | Depth of Boring: <u>35 / 60'</u>        |                       |  |  |
| Weather: <u>Sunny 95°</u>        |                    |                   |                | Ground Elevation:                         |                 |          |  | Water Level:                            |                       |  |  |
| Drilling Contractor: <u>7555</u> |                    |                   |                | Date/Time Started: <u>8/23/02 1:55P</u>   |                 |          |  | Date/Time Finished:                     |                       |  |  |
| Depth (ft)                       | Geologic sample ID | Sample Depth (ft) | Blows per foot | Recovery (in/ft)                          | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) | Lab Sample ID                           | Lab Sample Depth (ft) |  |  |
| 1                                |                    | 0.5'              |                |   |                 | ML       | <u>SILT (ML) (0-0.5')</u>  |   |                       |  |  |
| 2                                |                    |                   |                |   |                 | CL       | <u>Dr. Pale Brown, mostly silt, few fine sand, nonplastic</u>  |   |                       |  |  |
| 3                                |                    |                   |                |   |                 |          | <u>LEAN CLAY (CL) (0.5' - 5')</u>  |   |                       |  |  |
| 4                                |                    |                   |                |   |                 |          | <u>VERY STIFF Dr. to light gray, mostly red mottles, mostly clay, few silt, low to medium plasticity.</u>  |   |                       |  |  |
| 5                                |                    |                   |                |   |                 |          | <u>- Increasingly sandy &amp; 4' to 5' - Brown mottling instead of red in clay.</u>  |   |                       |  |  |
| 6                                |                    |                   |                |   |                 |          | <u>- light gray fine sand from casing -</u>  |   |                       |  |  |
| 7                                |                    |                   |                |   |                 | MR       |  |   |                       |  |  |
| 8                                |                    |                   |                |   |                 |          | <u>LEAN CLAY WITH SAND (CL) (CL)</u>   |   |                       |  |  |
| 9                                |                    |                   |                |   |                 | CL       | <u>Stiff, Dr. yellowish brown gray to light gray, mostly clay, little fine sand, few silt, low plasticity.</u>   |   |                       |  |  |
| 10                               |                    |                   |                |   |                 |          |  |   |                       |  |  |
| 11                               |                    |                   |                |   |                 | MR       |  |   |                       |  |  |
| 12                               |                    |                   |                |   |                 |          | <u>POORLY GRADED SAND (SP)</u>   |   |                       |  |  |
| 13                               |                    |                   |                |   |                 | SP       | <u>Dr. Pale Brown to very pale brown, mostly fine sand, some silt, non-plastic, few clay bands, reddish brown, low plasticity.</u>                                 |   |                       |  |  |
| 14                               |                    |                   |                |   |                 | CL       | <u>Irregularly sandy, silty clay -</u>   |   |                       |  |  |
| 15                               |                    |                   |                |   |                 | SP       | <u>LEAN CLAY (CL)</u>  |   |                       |  |  |
| 16                               |                    |                   |                |   |                 |          | <u>mostly, light gray, mostly clay, low plasticity.</u>  |   |                       |  |  |
| 17                               |                    |                   |                |   |                 |          | <u>POORLY GRADED SAND (SP)</u>   |   |                       |  |  |
| 18                               |                    |                   |                |   |                 |          | <u>mostly, pale yellow, mostly fine sand, few silt, nonplastic, some laminations.</u>  |   |                       |  |  |
| 19                               |                    |                   |                |   |                 |          | <u>- Boring wet below 49' to 55' -</u>   |   |                       |  |  |
| 20                               |                    |                   |                |   |                 |          |  |   |                       |  |  |

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
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Checked by

Date:

| AECOM      |                    |                   |              |                   |                 | Client: USACE     |  | Project Number: 602SG135 |            | Site Location: SAFE SD |  | Coordinates:        |  | Elevation:         |  | Boring ID: 50WV21    |  |
|------------|--------------------|-------------------|--------------|-------------------|-----------------|-------------------|--|--------------------------|------------|------------------------|--|---------------------|--|--------------------|--|----------------------|--|
|            |                    |                   |              |                   |                 | Drilling Method:  |  | Sample Type(s):          |            | Weather:               |  | Logged By: M. Law   |  | Date/Time Started: |  | Depth of Boring: 35' |  |
|            |                    |                   |              |                   |                 | Ground Elevation: |  |                          |            |                        |  | Boring Diameter:    |  | Screened Interval: |  | Water Level:         |  |
|            |                    |                   |              |                   |                 | Sample Type(s):   |  |                          |            |                        |  | Date/Time Finished: |  |                    |  |                      |  |
| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches) | Headspace (ppm) | USCS              | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID            | Depth (ft) |                        |  |                     |  |                    |  |                      |  |
| 21         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 22         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 23         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 24         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 25         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 26         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 27         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 28         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 29         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 30         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 31         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 32         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 33         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 34         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 35         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 36         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 37         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 38         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 39         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |
| 40         |                    |                   |              |                   |                 |                   |  |                          |            |                        |  |                     |  |                    |  |                      |  |

**Notes:**

End of Boring @ 35' BGS  
LEAN CLAY WITH SAND (CL) (35' - 35.5')  
Soft, moist, yellowish red, with light olive brown mottles of fine sand, mostly clay, little fine sand, low plasticity.

POORLY GRADDED SAND WITH SILT (SP)  
More to dense, wet, light olive brown, poorly fine sand, little silt, trace mica, thin silt laminations.

SAME AS ABOVE  
light olive brown, trace mica

SAME AS ABOVE  
wet to moist @ 34' BGS

9/8/13 →

NOTES:

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Depth to groundwater while drilling: \_\_\_\_\_

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

50WV22

| AECOM                                 |                    |                   |          | Client: <u>USACE</u>           |                 |      |  | Project Number: <u>60486/20</u>         |            |  |  | Boring ID: <u>50DPT-8</u>             |  |  |  |
|---------------------------------------|--------------------|-------------------|----------|--------------------------------|-----------------|------|--|---|------------|--|--|---------------------------------------|--|--|--|
|                                       |                    |                   |          | Site Location: <u>542 50</u>   |                 |      |  | Elevation:                              |            |  |  | Sheet: 1 of 2                         |  |  |  |
|                                       |                    |                   |          | Coordinates:                   |                 |      |  | Drilling Method: <u>DPT/HSA</u>         |            |  |  | Monitoring Well Installed: <u>YES</u> |  |  |  |
|                                       |                    |                   |          | Sample Type(s): <u>Machine</u> |                 |      |  | Boring Diameter: <u>3"</u>              |            |  |  | Screened Interval:                    |  |  |  |
| Weather: <u>Sunny 92</u>              |                    |                   |          | Logged By: <u>M. Law</u>       |                 |      |  | Date/Time Started: <u>7/23/12 1650</u>  |            |  |  | Depth of Boring: <u>30' 35'</u>       |  |  |  |
| Drilling Contractor: <u>Fogra/TSS</u> |                    |                   |          | Ground Elevation:              |                 |      |  | Date/Time Finished: <u>7/25/12 1642</u> |            |  |  | Water Level:                          |  |  |  |
| Depth (ft)                            | Geologic sample ID | Sample Depth (ft) | Blow Pct | Recovery (inches)              | Headspace (ppm) | USCS | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID                           | Depth (ft) |  |  |                                       |  |  |  |
| 1                                     |                    | 0' - 0.5'         |          |                                |                 | ML   | SILT (ML) (0 - 0.5')   |   |            |  |  |                                       |  |  |  |
| 2                                     |                    |                   |          |                                |                 | CL   | Dry, light brown, mostly silt, fine sand, non-plastic  |   |            |  |  |                                       |  |  |  |
| 3                                     |                    | 2.5'              |          | 99%                            |                 | CL   | LEAN CLAY with silt (CL) (0.5 - 2.5')<br>Dry, reddish brown, mostly clay, little silt, low plasticity.   |   |            |  |  |                                       |  |  |  |
| 4                                     |                    |                   |          |                                |                 |      | LEAN CLAY (CL) (2.5' - 7')   |   |            |  |  |                                       |  |  |  |
| 5                                     |                    |                   |          |                                |                 |      | Dry, very stiff, gray with redd to brown mottles, fine grained, medium plasticity.   |   |            |  |  |                                       |  |  |  |
| 6                                     |                    |                   |          |                                |                 |      |  |   |            |  |  |                                       |  |  |  |
| 7                                     |                    | 7' - 7.5'         |          |                                |                 | SP   | POORLY GRADED SAND with silt (SP) (7 - 7.5')<br>Dry, medium brown, mostly fine sand, little silt, fine grained, non-plastic  |   |            |  |  |                                       |  |  |  |
| 8                                     |                    |                   |          | 100%                           |                 | CL   | LEAN CLAY with silt (CL) (7.5' - 10')  |   |            |  |  |                                       |  |  |  |
| 9                                     |                    |                   |          |                                |                 |      | Dry, gray with brown mottles, mostly clay, little sand   |   |            |  |  |                                       |  |  |  |
| 10                                    |                    | 10'               |          |                                |                 | CL   | Fine grained, low plasticity   |   |            |  |  |                                       |  |  |  |
| 11                                    |                    |                   |          |                                |                 |      | LEAN CLAY (CL) (10' - 12.5')   |   |            |  |  |                                       |  |  |  |
| 12                                    |                    |                   |          |                                |                 |      | Dry, very stiff, gray with brown mottles, mostly clay, trace sand, fine grained, medium plasticity   |   |            |  |  |                                       |  |  |  |
| 13                                    |                    | 12.5'             |          | 100%                           |                 | CL   | SAND AS ABOVE (12.5' - 15.5')<br>Black & brown mottles   |   |            |  |  |                                       |  |  |  |
| 14                                    |                    |                   |          |                                |                 |      |  |   |            |  |  |                                       |  |  |  |
| 15                                    |                    | 15'               |          |                                |                 | SP   | Purely GRADED SAND with silt (SP) (15' - 16.5')  |   |            |  |  |                                       |  |  |  |
| 16                                    |                    |                   |          |                                |                 |      | Dry to moist, gray, mostly sand, little silt, fine grained, non-plastic.   |   |            |  |  |                                       |  |  |  |
| 17                                    |                    | 16.5'             |          | 100%                           |                 | CL   | LEAN CLAY (CL) (16.5' - 18.5')   |   |            |  |  |                                       |  |  |  |
| 18                                    |                    |                   |          |                                |                 |      | Moist, brown, sandy clay, trace silt, medium plasticity  |   |            |  |  |                                       |  |  |  |
| 19                                    |                    | 18.5'             |          |                                |                 | CL   | 3" Purple string @ 18' 10", 100% Laminations. CLAYEY   |   |            |  |  |                                       |  |  |  |
| 20                                    |                    |                   |          |                                |                 | SP   | Silt. Brown Laminated clays below  |   |            |  |  |                                       |  |  |  |
|                                       |                    |                   |          |                                |                 |      | Purely Graded SAND with silt (SP) (18.5' - ) Laminated   |   |            |  |  |                                       |  |  |  |

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
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Checked by:

Date:

50 WW 22

| AECOM                      |  |  |  | Client: USACE  |  |  |  | Boring ID: 50WW-8 / <del>50WW-2</del> |  |  |  |  |
|----------------------------|--|--|--|--|--|--|--|---------------------------------------|--|--|--|--|
| Project Number:            |  |  |  | Site Location: Sta 50  |  |  |  | Sheet: 2 of 2                         |  |  |  |  |
| Coordinates:               |  |  |  | Elevation:   |  |  |  | Monitoring Well Installed:            |  |  |  |  |
| Drilling Method: DPT       |  |  |  | Sample Type(s):  |  |  |  | Screened Interval:                    |  |  |  |  |
| Weather: Sunny 92          |  |  |  | Logged By: A. L. W.  |  |  |  | Boring Diameter:                      |  |  |  |  |
| Drilling Contractor: Fugro |  |  |  | Ground Elevation:  |  |  |  | Date/Time Started:                    |  |  |  |  |
| Depth (ft)                 |  |  |  | Geologic sample ID   |  |  |  | Depth of Boring:                      |  |  |  |  |
| Sample Depth (ft)          |  |  |  | Blows per ft   |  |  |  | Water Level:                          |  |  |  |  |
| Recovery (inches)          |  |  |  | Headspace (ppm)  |  |  |  | Lab Sample ID                         |  |  |  |  |
| USCS                       |  |  |  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known) |  |  |  | Lab Sample                            |  |  |  |  |
| 21                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 22                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 23                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 24                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 25                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 26                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 27                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 28                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 29                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 30                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 31                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 32                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 33                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 34                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 35                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 36                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 37                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 38                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 39                         |  |  |  |  |  |  |  |                                       |  |  |  |  |
| 40                         |  |  |  |  |  |  |  |                                       |  |  |  |  |

20'

SP

POORLY GRADED SAND with SILT (SP)

moist to damp, yellowish brown, mostly fine sand, little silt, non-plastic, few laminae

SAME AS ABOVE

moist

DPT

End of Boring @ 30' Bgs

- DPT -

- HSA -

POORLY GRADED SAND with SILT (SP)

moist, yellowish brown, mostly fine sand, little silt, non-plastic, trace iron oxide banding, trace mica.

7 -70%

8 -80%

5 -80%

--- Iron oxide banding @ 24.5' Bgs -

End of Boring @ 35' Bgs

HSA

8/23/13

NOTES: Hydro-punch sampler reason interval 31-35' Bgs

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

Depth to groundwater while drilling

| A-Com   |        |      |   |  |    | Client: USACE<br>Project Number: 60256175<br>Site Location: Site 50<br>Coordinates:  |                       | BORING ID: SOWW-23             |  |
|---|--------|------|---|--|----|--|-----------------------|--------------------------------|--|
| Weather: Sunny<br>Drilling Contractor: TSS                            |        |      |   |  |    | Elevation  |                       | Sheet 1 of 2                   |  |
| Sample Type(s): Mill Barrel<br>Logged By: M.L.W.<br>Ground Elevation: |        |      |   |  |    | Boring Diameter: 8"  |                       | Monitoring Well Installed: Yes |  |
| Recovery (%)  |        |      |   |  |    | Date/Time Started: 8/25/13 0740  |                       | Screened Interval: 30' - 35'   |  |
| Blows per Foot  |        |      |   |  |    | Date/Time Finished: 8/25/13 0948   |                       | Depth of Boring: 35'           |  |
| Sample Depth (ft)   |        |      |   |  |    | Water Level:   |                       |                                |  |
| Geologic Sample ID  |        |      |   |  |    | Lab Sample ID  |                       | Lab Sample Depth (ft)          |  |
| 1   | -0.5'- |      |   |  |    | ML   | SILT (ML) (0' - 0.5') |                                |  |
| 2   |        | ~20% | 1 |  | CL | Dry, soft, pale brown, mostly silt, few fine sand, non-plastic, trace roots.   |                       |                                |  |
| 3   |        |      |   |  |    | LEAN CLAY (CL) (0.5' - 5')   |                       |                                |  |
| 4   |        |      |   |  |    | Dry, very stiff, reddish brown with gray mottles, mostly clay, trace fine sand, medium plasticity.   |                       |                                |  |
| 5   | -5'-   |      | 2 |  | CL | LEAN CLAY WITH SAND (CL) (5' - 15')  |                       |                                |  |
| 6   |        | 100% |   |  |    | Dry, very stiff, blue yellow, mostly clay, some fine sand, low plasticity.   |                       |                                |  |
| 7   |        |      |   |  |    | SAME AS ABOVE  |                       |                                |  |
| 8   |        | ~45% | 3 |  |    | Dry to moist, stiff, light yellowish brown with light reddish brown sand streaks, mostly clay, some fine sand, low plasticity, trace mica. |                       |                                |  |
| 9   |        |      |   |  |    | - thin iron oxide band @ 14.5' BS -  |                       |                                |  |
| 10  |        |      |   |  |    | POORLY GRADDED SAND WITH SILT (SP)   |                       |                                |  |
| 11  | -15'-  | ~80% | 4 |  | SP | Moist, fine-grained olive brown with bluish-gray banding @ 18' BS, non-plastic, mostly fine sand, little silt, trace clay.                 |                       |                                |  |
| 12  |        |      |   |  |    | - iron oxide staining & cementation @ 19.5' BS -   |                       |                                |  |
| 13  |        |      |   |  |    |  |                       |                                |  |
| 14  |        |      |   |  |    |  |                       |                                |  |
| 15  |        |      |   |  |    |  |                       |                                |  |
| 16  |        |      |   |  |    |  |                       |                                |  |
| 17  |        |      |   |  |    |  |                       |                                |  |
| 18  |        |      |   |  |    |  |                       |                                |  |
| 19  |        |      |   |  |    |  |                       |                                |  |
| 20  |        |      |   |  |    |  |                       |                                |  |

**NOTES:**

Depth to groundwater while drilling

Checked by: \_\_\_\_\_ Date: \_\_\_\_\_



50WW23

| <h1 style="text-align: center;">A=COM</h1> |                    |                   |                   |                 |          | Client: <u>USACE</u>  |               | BORING ID: <u>50WW23</u>            |  |
|--|--------------------|-------------------|-------------------|-----------------|----------|---|---------------|-------------------------------------|--|
|  |                    |                   |                   |                 |          | Project Number: <u>602SG135</u>   |               |                                     |  |
|  |                    |                   |                   |                 |          | Site Location: <u>Site 50</u>   |               |                                     |  |
|  |                    |                   |                   |                 |          | Coordinates:  |               | Elevation                           |  |
| Drilling Method:                           |                    |                   |                   |                 |          | Boring Diameter:  |               | Monitoring Well Installed:          |  |
| Sample Type(s):                            |                    |                   |                   |                 |          | Date/Time Started:  |               | Screened Interval:                  |  |
| Weather:                                   |                    |                   |                   |                 |          | Date/Time Finished:   |               | Depth of Boring:                    |  |
| Drilling Contractor:                       |                    |                   |                   |                 |          | Ground Elevation:   |               | Water Level:                        |  |
| Depth (ft)                                 | Geologic Sample ID | Sample Depth (ft) | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)  | Lab Sample ID | Lab Sample Depth (ft)               |  |
| 21   |                    |                   |                   |                 |          |   |               |                                     |  |
| 22   |                    |                   | ~80%              |                 | SP       | POORLY GRADDED SAND with Silts (SP)<br>moist, <del>loose</del> light olive brown, mostly fine sand,<br>little silt, trace clay stringers, trace mica,<br>non-pelagic. <del>fine</del> <sup>black</sup> laminations throughout |               |                                     |  |
| 23   |                    |                   |                   |                 |          |   |               |                                     |  |
| 24   |                    |                   |                   |                 |          |   |               |                                     |  |
| 25   |                    |                   |                   |                 |          |   |               |                                     |  |
| 26   |                    |                   |                   |                 |          | SAME AS ABOVE<br>fewer laminations  |               |                                     |  |
| 27   |                    |                   | ~70%              |                 |          |   |               |                                     |  |
| 28   |                    |                   |                   |                 |          |   |               |                                     |  |
| 29   |                    |                   |                   |                 |          | - clay stringers @ 25' Bgs, with some iron oxide staining   |               |                                     |  |
| 30   |                    |                   |                   |                 | SP       |   |               |                                     |  |
| 31   |                    |                   |                   |                 |          |   |               |                                     |  |
| 32   |                    |                   |                   |                 |          |   |               |                                     |  |
| 33   |                    |                   | ~50%              |                 | CL       | - 0.4' thick LEANCLAY (CL)<br>moist, light black clay, Low plasticity<br>Black laminations above and below clay layers.   |               |                                     |  |
| 34   |                    |                   |                   |                 | SP       |   |               |                                     |  |
| 35   |                    |                   |                   |                 |          | End of Boring @ 35' Bgs   |               |                                     |  |
| 36   |                    |                   |                   |                 |          |   |               |                                     |  |
| 37   |                    |                   |                   |                 |          |   |               |                                     |  |
| 38   |                    |                   |                   |                 |          |   |               |                                     |  |
| 39   |                    |                   |                   |                 |          |   |               |                                     |  |
| 40   |                    |                   |                   |                 |          |   |               |                                     |  |
| NOTES:                                     |                    |                   |                   |                 |          | Date  | Time          | Depth to groundwater while drilling |  |
|  |                    |                   |                   |                 |          |   |               |                                     |  |
|  |                    |                   |                   |                 |          |   |               |                                     |  |
|  |                    |                   |                   |                 |          |   |               |                                     |  |
|  |                    |                   |                   |                 |          |   |               |                                     |  |

Checked by:

Date:

00954165

C-50

50WW24

| A-COM  |  |  |  | Client: USACE          |  | Project Number: 62256135   |  | BORING ID: 50WW24   |  |
|--|--|--|--|------------------------|--|--|--|---------------------|--|
| Weather: Sunny 80°<br>Drilling Contractor: TSS |  |  |  | Site Location: Site 50 |  | Coordinates:   |  | Elevation           |  |
|  |  |  |  | Drilling Method: HSA   |  | Sample Type(s): All bore   |  | Boring Diameter: 8" |  |
| Depth (ft)                                     |  |  |  | Sample Depth (ft)      |  | Recovery (inches)  |  | Headspace (ppm)     |  |
| Geologic Sample ID                             |  |  |  | U.S.C.                 |  | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) |  | Lab Sample ID       |  |
| Depth (ft)                                     |  |  |  | Sample Depth (ft)      |  | Recovery (inches)  |  | Headspace (ppm)     |  |
| 1  |  |  |  |                        |  |  |  |                     |  |
| 2  |  |  |  |                        |  |  |  |                     |  |
| 3  |  |  |  |                        |  |  |  |                     |  |
| 4  |  |  |  |                        |  |  |  |                     |  |
| 5  |  |  |  |                        |  |  |  |                     |  |
| 6  |  |  |  |                        |  |  |  |                     |  |
| 7  |  |  |  |                        |  |  |  |                     |  |
| 8  |  |  |  |                        |  |  |  |                     |  |
| 9  |  |  |  |                        |  |  |  |                     |  |
| 10   |  |  |  |                        |  |  |  |                     |  |
| 11   |  |  |  |                        |  |  |  |                     |  |
| 12   |  |  |  |                        |  |  |  |                     |  |
| 13   |  |  |  |                        |  |  |  |                     |  |
| 14   |  |  |  |                        |  |  |  |                     |  |
| 15   |  |  |  |                        |  |  |  |                     |  |
| 16   |  |  |  |                        |  |  |  |                     |  |
| 17   |  |  |  |                        |  |  |  |                     |  |
| 18   |  |  |  |                        |  |  |  |                     |  |
| 19   |  |  |  |                        |  |  |  |                     |  |
| 20   |  |  |  |                        |  |  |  |                     |  |

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Recovery (inches) | Headspace (ppm) | U.S.C. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|-------------------|-----------------|--------|--|---------------|-----------------------|
| 1          |                    | 1'                |                   |                 | ML     | SILT (cm) (0-1')<br>Dry, pale brown, mostly silt, few fine sand, fine roots, non-plastic   |               |                       |
| 2          |                    |                   | ~50%              |                 | CL     | LEAN CLAY (CL) (1-2.5')<br>Dry, very stiff, Red with light brownish gray mottles, mostly clay, trace fine sand, to medium plasticity                               |               |                       |
| 3          |                    |                   | ~70%              |                 | ML     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 4          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 5          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 6          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 7          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 8          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 9          |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 10         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 11         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 12         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 13         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 14         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 15         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 16         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 17         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 18         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 19         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |
| 20         |                    |                   | ~50%              |                 | CL     | LEAN CLAY with sand (CL) (5'-6')<br>Dry to moist, stiff, light-brown, mostly clay, 1-1/2" fine sand, low plasticity  |               |                       |

NOTES:

Date

Time

Depth to groundwater while drilling

Checked by:

Date:

00954166

C-51



**AECOM**

Client: USACE  
 Project Number: 60256135  
 Site Location: Site 50  
 Coordinates:

Elevation:

Drilling Method: PPT/HSASample Type(s): Macrolog/Logs/coresLogged By: M. Low

Ground Elevation:

Boring Diameter: 2' 1/8"Date/Time Started: 7/26/13 164Date/Time Finished: 7/26/13 144Water Level: 144Weather: Cloudy 85Drilling Contractor: Fugro/TSSSheet: 1 of 3Monitoring Well Installed: WaterScreened Interval: 45'-55'Depth of Boring: 20' 50"Water Level: 144

| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Blowcount | Recovery (inches) | USCS | Headspace (ppm) | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|-----------|-------------------|------|-----------------|--|---------------|-----------------------|
| 1          |                    | -0.5'             |           |                   | ML   |                 | SILT (CL) (0-0.5')   |               |                       |
| 2          |                    |                   | 1 - 90%   |                   | CL   |                 | Arg, <del>dark brown</del> , mostly silt, few fine sand, non-plastic   |               |                       |
| 3          |                    |                   |           |                   |      |                 | LEAN CLAY (CL) (0.5-5.5')  |               |                       |
| 4          |                    |                   |           |                   |      |                 | 5.5 ft, Arg, yellowish brown, mostly clay, trace fine sand, Low plasticity. Red, brown x black mottles   |               |                       |
| 5          |                    |                   |           |                   |      |                 | - clay becomes stiffer -   |               |                       |
| 6          |                    | -5.5'             |           |                   |      |                 | - thin, dry, fine sand lenses @ 5.5' Bgs   |               |                       |
| 7          |                    | -7'               | 2 - 240%  |                   | CL   |                 | LEAN CLAY with SAND (CL) (5.5-7')  |               |                       |
| 8          |                    |                   |           |                   | CL   |                 | Silt, yellowish clay, mostly clay, 1.0% fine sand, Low plasticity  |               |                       |
| 9          |                    |                   |           |                   |      |                 | LEAN CLAY (CL) (7' -   |               |                       |
| 10         |                    |                   |           |                   |      |                 | stiff, Arg, yellowish, with brown & black mottles, few to trace fine sand, Low plasticity to medium plasticity   |               |                       |
| 11         |                    |                   |           |                   |      |                 | - thin, dry, fine sand lenses @ 11.5' x 12.5' Bgs  |               |                       |
| 12         |                    | -11.5'            | 3 - 90%   |                   | CL   |                 | - clay becomes very stiff -  |               |                       |
| 13         |                    |                   |           |                   |      |                 | - increasing fine sand -   |               |                       |
| 14         |                    | -13.5'            |           |                   |      |                 |  |               |                       |
| 15         |                    |                   |           |                   |      |                 |  |               |                       |
| 16         |                    |                   |           |                   |      |                 |  |               |                       |
| 17         |                    | -17'              | 4 - 90%   |                   | SP   |                 | POORLY SORTED SAND with SILT (SP) (17' - 20')  |               |                       |
| 18         |                    |                   |           |                   |      |                 | mostly yellowish brown, mostly fine sand, 1.0% silt  |               |                       |
| 19         |                    |                   |           |                   |      |                 | trace mica, non-plastic, iron staining @ 16.25' Bgs  |               |                       |
| 20         |                    |                   |           |                   |      |                 | trace sandstone, reddish brown color, dark yellowish   |               |                       |
|            |                    |                   |           |                   |      |                 | End of Boring @ 20' Bgs  |               |                       |

NOTES: Hydro punch screen interval set @ 22' - 28' Bgs

Date

Time

Depth to groundwater while drilling

Checked by

Date



50WW25

|                      |                   |                            |
|----------------------|-------------------|----------------------------|
| <b>A=COM</b>         | Client:           |                            |
|                      | Project Number:   |                            |
|                      | Site Location:    |                            |
|                      | Coordinates:      | Elevation                  |
|                      | Drilling Method:  |                            |
| Weather:             | Sample Type(s):   |                            |
|                      | Logged By:        | Boring Diameter:           |
|                      | Ground Elevation: | Date/Time Started:         |
|                      |                   | Date/Time Finished:        |
| Drilling Contractor: |                   | Monitoring Well Installed: |
|                      |                   | Screened Interval:         |
|                      |                   | Depth of Boring:           |
|                      |                   | Water Level:               |

BORING ID: 50DPT-14

50WWP

Sheet 2 of 3

Monitoring Well Installed:

Screened Interval:

Depth of Boring:

Water Level:

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per 6" | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)   | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|-------------------|-----------------|----------|--|---------------|-----------------------|
| 21         |                    |                   |              |                   |                 | SM       | SILTY SAND POORLY GRADED (SM)<br>Wet, loose, Yellow Brown, mostly fine sand, non-plastic, becoming denser with depth. Oxidation layer at 23'-23.5' from bottom of sample with some cementation.                    |               |                       |
| 22         |                    |                   | 5            | 50%               |                 | CL       | SANDY CLAY (CL)  |               |                       |
| 23         |                    |                   |              |                   |                 |          | Wet, soft, yellow brown, mostly fine sand, low-plasticity, trace mica  |               |                       |
| 24         |                    |                   |              |                   |                 | SP       | SAND WITH SILT (SP)  |               |                       |
| 25         |                    |                   |              | 100%              |                 |          | Wet and becoming moist at bottom of core, loose and becoming more dense at bottom of core. Yellowish brown, mostly fine sand with interbedded clay. Clay is slightly plastic.                                      |               |                       |
| 26         |                    |                   | 6            |                   |                 | SM/CL    | INTERBEDDED SILTY SAND AND CLAY (SM/CL)  |               |                       |
| 27         |                    |                   |              |                   |                 |          | Moist, loose getting more dense at the bottom, yellowish brown except 6'-10' at 34.5' to 35' color changes to brown. Mostly fine grain sand, clay at low to slightly plastic. Interbedding ranges from 3" to 1/4". |               |                       |
| 28         |                    |                   | 7            | 100%              |                 | SP       | SAND WITH SILT (SP)  |               |                       |
| 29         |                    |                   |              |                   |                 |          | Wet to slightly moist towards bottom of core, dark grayish brown, non-plastic, oxidation layer throughout excluding 37'-38', 39.8'-39.9' has organic tagged streaks.   |               |                       |
| 30         |                    |                   | 8            | 100%              |                 |          | 39.5'-40' has clay layers. clay has low plasticity.  |               |                       |
| 31         |                    |                   |              |                   |                 |          |  |               |                       |
| 32         |                    |                   |              |                   |                 |          |  |               |                       |
| 33         |                    |                   |              |                   |                 |          |  |               |                       |
| 34         |                    |                   |              |                   |                 |          |  |               |                       |
| 35         |                    |                   |              |                   |                 |          |  |               |                       |
| 36         |                    |                   |              |                   |                 |          |  |               |                       |
| 37         |                    |                   |              |                   |                 |          |  |               |                       |
| 38         |                    |                   |              |                   |                 |          |  |               |                       |
| 39         |                    |                   |              |                   |                 |          |  |               |                       |
| 40         |                    |                   |              |                   |                 |          |  |               |                       |

## NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by:

Date:

00954169

C-54

50WVW25

| <b>A=COM</b><br>Client:<br>Project Number:<br>Site Location:<br>Coordinates:<br>Drilling Method:<br>Sample Type(s):<br>Weather:<br>Drilling Contractor: |                    | Boring ID: 50WVW-11/<br><del>50WVW-11</del> |              | Sheet 3 of 3<br>Monitoring Well Installed:<br>Screened Interval:<br>Depth of Boring:<br>Water Level: |                 |          |   |                                     |                       |
|---|--------------------|---|--------------|--|-----------------|----------|---|-------------------------------------|-----------------------|
|   |                    | Elevation                                   |              |  |                 |          |   |                                     |                       |
|   |                    | Boring Diameter:                            |              |  |                 |          |   |                                     |                       |
|   |                    | Date/Time Started:                          |              |  |                 |          |   |                                     |                       |
|   |                    | Date/Time Finished:                         |              |  |                 |          |   |                                     |                       |
| Depth (ft)  | Geologic Sample ID | Sample Depth (ft)                           | Blows per 6" | Recovery (feet)  | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known)  | Lab Sample ID                       | Lab Sample Depth (ft) |
| 41  |                    |   |              |  |                 |          |   |                                     |                       |
| 42  |                    |   | 9            | 25%  |                 | SP       | <p>SAND WITH SILT (SP)</p> <p>Same as above, wet, poorly graded</p> <p>4 1/2 inches of Clay shale at bottom of Shoe, light yellowish brown followed by 1.5" of <del>light</del> then back to the sand with silt from above, dry. black organics</p> |                                     |                       |
| 43  |                    |   |              |  |                 |          |   |                                     |                       |
| 44  |                    |   |              |  |                 |          |   |                                     |                       |
| 45  |                    |   |              |  |                 |          |   |                                     |                       |
| 46  |                    |   |              |  |                 |          |   |                                     |                       |
| 47  |                    |   | 10           | 100%   |                 | CL       | <p>Same as above, moist</p> <p>THINLY LAMINATED CLAY WITH SAND</p> <p>Very fine sand, trace silt, dry, silty</p> <p>Clay has low plasticity, few sand, dark gray, sand lens as are gray</p>   |                                     |                       |
| 48  |                    |   |              |  |                 | OR       |   |                                     |                       |
| 49  |                    |   |              |  |                 |          |   |                                     |                       |
| 50  |                    |   |              |  |                 |          |   |                                     |                       |
| 51  |                    |   |              |  |                 |          |   |                                     |                       |
| 52  |                    |   | 11           | 90%  |                 |          | <p>THINLY LAMINATED CLAY WITH SAND LENSES</p> <p>Low plasticity, trace sand lenses, sand is very fine, dry, dark gray clay with gray lenses.</p>  |                                     |                       |
| 53  |                    |   |              |  |                 |          |   |                                     |                       |
| 54  |                    |   |              |  |                 |          |   |                                     |                       |
| 55  |                    |   |              |  |                 |          | End of Boring @ 55' Bgr   |                                     |                       |
| 56  |                    |   |              |  |                 |          |   |                                     |                       |
| 57  |                    |   |              |  |                 |          |   |                                     |                       |
| 58  |                    |   |              |  |                 |          |   |                                     |                       |
| 59  |                    |   |              |  |                 |          |   |                                     |                       |
| 60  |                    |   |              |  |                 |          |   |                                     |                       |
| NOTES:  |                    |   |              |  |                 |          |   |                                     |                       |
| Checked by:   |                    |   |              |  |                 | Date:    |   | Depth to groundwater while drilling |                       |
|   |                    |   |              |  |                 |          |   |                                     |                       |
|   |                    |   |              |  |                 |          |   |                                     |                       |
|   |                    |   |              |  |                 |          |   |                                     |                       |
|   |                    |   |              |  |                 |          |   |                                     |                       |
|   |                    |   |              |  |                 |          |   |                                     |                       |

00954170

C-55

50WW26

| AECOM                           |                    |                   |              | Client: <u>USACE</u>          |                 |          |  | Boring ID: <u>50WW26</u>              |                       |  |  |
|---------------------------------|--------------------|-------------------|--------------|-------------------------------|-----------------|----------|--|---------------------------------------|-----------------------|--|--|
| Project Number: <u>60251135</u> |                    |                   |              | Site Location: <u>Site 50</u> |                 |          |  | Elevation:                            |                       |  |  |
| Coordinates:                    |                    |                   |              | Drilling Method: <u>HSA</u>   |                 |          |  | Monitoring Well Installed: <u>Yes</u> |                       |  |  |
| Sample Type(s): <u>M/S</u>      |                    |                   |              | Boring Diameter: <u>8"</u>    |                 |          |  | Screened Interval: <u>20-25/45-60</u> |                       |  |  |
| Weather: <u>Sunny 95°</u>       |                    |                   |              | Logged By: <u>M. L. W.</u>    |                 |          |  | Depth of Boring: <u>35' 60"</u>       |                       |  |  |
| Drilling Contractor: <u>TSS</u> |                    |                   |              | Ground Elevation:             |                 |          |  | Water Level:                          |                       |  |  |
| Depth (ft)                      | Geologic sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches)             | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) | Lab Sample ID                         | Lab Sample Depth (ft) |  |  |
| 1                               |                    | 0.5'              |              |                               |                 | ML       | <u>SILT (ML) (0-0.5')</u>  |                                       |                       |  |  |
| 2                               |                    |                   | 1            | 45%                           |                 | CL       | <u>10% Pale Brown, mostly silt, few fine sand, nonplastic roots</u>  |                                       |                       |  |  |
| 3                               |                    |                   |              |                               |                 |          | <u>LEAN CLAY (CL) (0.5' - 5')</u>  |                                       |                       |  |  |
| 4                               |                    |                   |              |                               |                 |          | <u>Very stiff, dry, white with red mottles, mostly clay, few silt, low to medium plasticity.</u>   |                                       |                       |  |  |
| 5                               |                    |                   |              |                               |                 |          | <u>- Increasing sand &amp; 4' dry, brown mottling instead of red in clay.</u>  |                                       |                       |  |  |
| 6                               |                    |                   |              |                               |                 |          |  |                                       |                       |  |  |
| 7                               |                    |                   |              |                               |                 | MR       | <u>- light gray fine sand fine clittings -</u>   |                                       |                       |  |  |
| 8                               |                    |                   | 2            | 25%                           |                 |          |  |                                       |                       |  |  |
| 9                               |                    |                   |              |                               |                 | CL       | <u>LEAN CLAY WITH SAND (CL)</u>  |                                       |                       |  |  |
| 10                              |                    |                   |              |                               |                 |          | <u>stiff, dry, yellowish brown granular to light gray, mostly clay, little fine sand, few silt, low plasticity.</u>  |                                       |                       |  |  |
| 11                              |                    |                   |              |                               |                 | MR       |  |                                       |                       |  |  |
| 12                              |                    |                   |              |                               |                 |          |  |                                       |                       |  |  |
| 13                              |                    |                   | 3            | 50%                           |                 | SP       | <u>POORLY GRAINED SAND (SP)</u>  |                                       |                       |  |  |
| 14                              |                    |                   |              |                               |                 |          | <u>dry, pale brown to very pale brown, mostly fine sand, trace silt, nonplastic, few clay bands, reddish brown, low plasticity</u>                                 |                                       |                       |  |  |
| 15                              |                    |                   |              |                               |                 | CL       | <u>Fine, white silty clay</u>  |                                       |                       |  |  |
| 16                              |                    |                   |              |                               |                 | SP       | <u>LEAN CLAY (CL)</u>  |                                       |                       |  |  |
| 17                              |                    |                   |              |                               |                 |          | <u>medium, light gray, mostly clay, low plasticity</u>   |                                       |                       |  |  |
| 18                              |                    |                   |              |                               |                 | SP       | <u>POORLY GRAINED SAND (SP)</u>  |                                       |                       |  |  |
| 19                              |                    |                   |              |                               |                 |          | <u>medium, pale yellow, mostly fine sand, few silt, nonplastic some laminations</u>  |                                       |                       |  |  |
| 20                              |                    |                   | 4            | 80%                           |                 |          | <u>- Boring not below 49' Bgs -</u>  |                                       |                       |  |  |

NOTES:

Date

Time

Depth to groundwater while drilling

Checked by

Date:

| AECOM                            |                    |                   |             |                   |                 | Client: <u>USACE</u>     |  | 50WW26                      |                       |
|----------------------------------|--------------------|-------------------|-------------|-------------------|-----------------|--------------------------|--|-----------------------------|-----------------------|
| Project Number: <u>620256135</u> |                    |                   |             |                   |                 | Boring ID: <u>50WW26</u> |  |                             |                       |
| Site Location: <u>Site 50</u>    |                    |                   |             |                   |                 | Elevation:               |  |                             |                       |
| Coordinates:                     |                    |                   |             |                   |                 | Boring Diameter:         |  |                             |                       |
| Drilling Method:                 |                    |                   |             |                   |                 | Date/Time Started:       |  | Monitoring Well Installed:  |                       |
| Sample Type(s):                  |                    |                   |             |                   |                 | Date/Time Finished:      |  | Screened Interval:          |                       |
| Weather:                         |                    |                   |             |                   |                 | Logged By: <u>M. Law</u> |  | Depth of Boring: <u>35'</u> |                       |
| Drilling Contractor:             |                    |                   |             |                   |                 | Ground Elevation:        |  | Water Level:                |                       |
| Depth (ft)                       | Geologic sample ID | Sample Depth (ft) | Blow per ft | Recovery (inches) | Headspace (ppm) | USCS                     | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if Known) | Lab Sample ID               | Lab Sample Depth (ft) |
| 21                               |                    |                   |             |                   |                 | SP                       | POORLY GRAINED SAND WITH SILT (SP)   |                             |                       |
| 22                               |                    |                   | 5           | 90%               |                 |                          | moist, yellowish brown, mostly fine sand, little silt, non-plastic, few laminae, thin oxide bands @ 23' & 25' B  |                             |                       |
| 23                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 24                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 25                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 26                               |                    |                   |             |                   |                 |                          | SAME AS ABOVE  |                             |                       |
| 27                               |                    |                   |             |                   |                 |                          | light olive brown, trace mica  |                             |                       |
| 28                               |                    |                   | 6           | 90%               |                 |                          |  |                             |                       |
| 29                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 30                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 31                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 32                               |                    |                   | 7           | 90%               |                 |                          | SAME AS ABOVE  |                             |                       |
| 33                               |                    |                   |             |                   |                 |                          | wet to moist @ 34'-B   |                             |                       |
| 34                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 35                               |                    |                   |             |                   |                 |                          |  |                             |                       |
| 36                               |                    | -35.5'            |             |                   | CL              | End of Boring @ 35' B    | LEAN CLAY WITH SAND (CL) (35'-35.5')   |                             |                       |
| 37                               |                    |                   |             |                   | SP              |                          | silt, moist, yellowish red, with light olive brown nodules of fine sand, mostly clay, little fine sand, low plasticity   |                             |                       |
| 38                               |                    |                   | 8           | 90%               |                 |                          | POORLY GRAINED SAND WITH SILT (SP)   |                             |                       |
| 39                               |                    |                   |             |                   |                 |                          | moist to dense, wet, light olive brown, fairly fine sand, little silt, trace mica, thin silt laminae   |                             |                       |
| 40                               |                    |                   |             |                   |                 |                          |  |                             |                       |

9/8/13 →

NOTES:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

Checked by:

Date:



50WN26

| <b>A-Com</b>                 |                    | Client: <u>USACE</u>          |              | Project Number: <u>60256135</u> |                 | BORING ID: <u>50WN K/S</u> |  |               |                       |
|------------------------------|--------------------|-------------------------------|--------------|---------------------------------|-----------------|----------------------------|--|---------------|-----------------------|
|                              |                    | Site Location: <u>Site 50</u> |              | Coordinates: <u>Elevation</u>   |                 | Sheet 3 of <u>3</u>        |  |               |                       |
|                              |                    | Drilling Method: <u></u>      |              | Boring Diameter: <u></u>        |                 | Screened Interval: <u></u> |  |               |                       |
|                              |                    | Sample Type(s): <u></u>       |              | Date/Time Started: <u></u>      |                 | Depth of Boring: <u></u>   |  |               |                       |
| Weather: <u></u>             |                    | Logged By: <u></u>            |              | Date/Time Finished: <u></u>     |                 | Water Level: <u></u>       |  |               |                       |
| Drilling Contractor: <u></u> |                    | Ground Elevation: <u></u>     |              |                                 |                 |                            |  |               |                       |
| Depth (ft)                   | Geologic Sample ID | Sample Depth (ft)             | Blows per ft | Recovery (inches)<br>%          | Headspace (ppm) | U.S.C.s                    | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
| 41                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 42                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 43                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 44                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 45                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 46                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 47                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 48                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 49                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 50                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 51                           |                    | -50'                          |              |                                 |                 | SC                         | POORLY GRADDED SAND WITH SILT (SP)<br>loose, wet, light olive brown, mostly fine sand, little silt, trace mica, thin laminations of silt throughout.               |               |                       |
| 52                           |                    | -51.5'                        |              |                                 |                 | CL                         | SAME AS ABOVE<br>with two zones of iron oxide cemented sand, friable, yellowish red, moist   |               |                       |
| 53                           |                    | -52'                          |              |                                 |                 | SP                         |  |               |                       |
| 54                           |                    | -53'                          |              |                                 |                 | CL/SP                      |  |               |                       |
| 55                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 56                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 57                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 58                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 59                           |                    |                               |              |                                 |                 |                            |  |               |                       |
| 60                           |                    |                               |              |                                 |                 |                            |  |               |                       |

## NOTES:

End of Boring @ 60' 1/2"

Depth to groundwater while drilling

Date Time

Checked by:

Date:

| AECOM                      |                    |                   |                    |              |                 | Client: USACE                 |  | Boring ID: SDOPT-14 /<br>SDOT-14  |                       |
|----------------------------|--------------------|-------------------|--------------------|--------------|-----------------|-------------------------------|--|-----------------------------------|-----------------------|
|                            |                    |                   |                    |              |                 | Project Number: 60266125      |  |                                   |                       |
|                            |                    |                   |                    |              |                 | Site Location: Site 50        |  |                                   |                       |
|                            |                    |                   |                    |              |                 | Coordinates:                  |  | Elevation:                        |                       |
|                            |                    |                   |                    |              |                 | Drilling Method: RPT          |  | Sheet: 1 of 3                     |                       |
|                            |                    |                   |                    |              |                 | Sample Type(s): Miscellaneous |  | Monitoring Well Installed: No Yes |                       |
| Weather: Sunny 82° F       |                    |                   |                    |              |                 | Logged By: M. Low             |  | Screened Interval:                |                       |
| Drilling Contractor: Fargo |                    |                   |                    |              |                 | Ground Elevation:             |  | Depth of Boring: 25'              |                       |
|                            |                    |                   |                    |              |                 | Date/Time Started: 7/25/13 AM |  | Water Level:                      |                       |
|                            |                    |                   |                    |              |                 | Date/Time Finished: 7/25/13   |  |                                   |                       |
| Depth (ft)                 | Geologic sample ID | Sample Depth (ft) | Blow count<br>P.h. | Recovery (%) | Headspace (ppm) | USCS                          | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID                     | Lab Sample Depth (ft) |
| 1                          |                    | 0'                |                    |              |                 | ML                            | SILT (ML) (0-5')   |                                   |                       |
| 2                          |                    |                   | 1                  | ~60%         |                 |                               | Dry, Dark yellowish Brown grading to brownish yellow, mostly silt. Fine grained, non-plastic, trace fine sand at foot of sample.                                   |                                   |                       |
| 3                          |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 4                          |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 5                          |                    | -5'               |                    |              |                 | CL                            | LEAN CLAY (CL) (5'-14.5')  |                                   |                       |
| 6                          |                    |                   |                    |              |                 |                               | Dry, grey with Red mottling, mostly clayey to Brown @ 7' Bgs, then black @ 7.5' Bgs. Fine grain, mostly clay true silt, medium plasticity, very stiff              |                                   |                       |
| 7                          |                    |                   | 2                  | 100%         |                 |                               |  |                                   |                       |
| 8                          |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 9                          |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 10                         |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 11                         |                    |                   |                    |              |                 | CL                            | SAME AS ABOVE  |                                   |                       |
| 12                         |                    |                   |                    |              |                 |                               | no mottling, homotexture and water-shedding @ 13' Bgs  |                                   |                       |
| 13                         |                    |                   | 3                  | 100%         |                 | F <sub>o</sub> F <sub>e</sub> |  |                                   |                       |
| 14                         |                    | -14.5'            |                    |              |                 | SP                            | Absolutely Gravelly Sand with Silt (SP) (14.5'-21.5')  |                                   |                       |
| 15                         |                    |                   |                    |              |                 |                               | Dry to moist, gray to Brown, fine-grained, mostly fine sand, little silt, non-plastic  |                                   |                       |
| 16                         |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 17                         |                    |                   |                    |              |                 |                               |  |                                   |                       |
| 18                         |                    |                   | 4                  |              |                 |                               |  |                                   |                       |
| 19                         |                    |                   |                    |              |                 |                               | SAME AS ABOVE  |                                   |                       |
| 20                         |                    |                   |                    |              |                 |                               | moist  |                                   |                       |

**NOTES:**

Date \_\_\_\_\_ Time \_\_\_\_\_ Depth to groundwater while drilling \_\_\_\_\_

Checked by \_\_\_\_\_ Date \_\_\_\_\_

50W N 27

| AECOM      |                    |                   |           | Client: <u>USACE</u>              |                 |  |  | Boring ID: <u>SDDPT-14</u><br><u>SDDPT-15</u> |            |  |  |
|------------|--------------------|-------------------|-----------|-----------------------------------|-----------------|--|--|---|------------|--|--|
|            |                    |                   |           | Project Number: _____             |                 |  |  | Sheet: <u>2 of 3</u>                          |            |  |  |
|            |                    |                   |           | Site Location: <u>540 SO</u>      |                 |  |  | Elevation: _____                              |            |  |  |
|            |                    |                   |           | Coordinates: _____                |                 |  |  | Monitoring Well Installed: _____              |            |  |  |
|            |                    |                   |           | Drilling Method: <u>DPT</u>       |                 |  |  | Screened Interval: _____                      |            |  |  |
|            |                    |                   |           | Sample Type(s): _____             |                 |  |  | Depth of Boring: _____                        |            |  |  |
|            |                    |                   |           | Weather: <u>Sunny Pt.</u>         |                 |  |  | Water Level: _____                            |            |  |  |
|            |                    |                   |           | Drilling Contractor: <u>Fugro</u> |                 |  |  | Date/Time Started: _____                      |            |  |  |
|            |                    |                   |           | Logged By: <u>M. Lew/AS</u>       |                 |  |  | Date/Time Finished: _____                     |            |  |  |
|            |                    |                   |           | Ground Elevation: _____           |                 |  |  |   |            |  |  |
| Depth (ft) | Geologic sample ID | Sample Depth (ft) | Blowcount | Recovery (%)                      | Headspace (ppm) | USCS                                       | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known) | Lab Sample ID                                 | Depth (ft) |  |  |
| 21         |                    |                   |           |                                   |                 | SP   | POORLY GRAINED SAND WITH SILT (SP) (24.5-22.5)   |   |            |  |  |
| 22         |                    |                   |           |                                   |                 |  | moist to damp, grayish brown, varying fine sand, little silt, non-plastic.   |   |            |  |  |
| 23         |                    |                   |           |                                   |                 | SP   | LEAN CLAY FL (22.5-23)   |   |            |  |  |
| 24         |                    |                   |           |                                   |                 |  | moist, purple clay, mostly clay, few silt, trace mica, low plasticity  |   |            |  |  |
| 25         |                    |                   |           |                                   |                 | POORLY GRAINED SAND WITH SILT (SP) (23-25) |  |   |            |  |  |
| 26         |                    |                   |           |                                   |                 |  | moist, brown, mostly fine sand, little silt, trace mica, non-plastic   |   |            |  |  |
| 27         |                    |                   |           |                                   |                 | SP   | End of Soil Boring @ 25' <sup>th</sup> Poorly GRAINED SAND WITH SILT (SP) (25-30)  |   |            |  |  |
| 28         |                    |                   |           |                                   |                 |  | moist to moist, loose, dark yellowish brown, mostly fine sand, little silt, trace mica, non-plastic, iron oxide staining between 27-29                             |   |            |  |  |
| 29         |                    |                   |           |                                   |                 |  |  |   |            |  |  |
| 30         |                    |                   |           |                                   |                 |  |  |   |            |  |  |
| 31         |                    |                   |           |                                   |                 |  | SAME AS ABOVE  |   |            |  |  |
| 32         |                    |                   |           |                                   |                 |  | 32-32.4 ft iron oxide staining with concentration, moist   |   |            |  |  |
| 33         |                    |                   |           |                                   |                 |  | At 33 ft thin clay stringers w/ 3 ft ft.   |   |            |  |  |
| 34         |                    |                   |           |                                   |                 |  |  |   |            |  |  |
| 35         |                    |                   |           |                                   |                 |  | SAME AS ABOVE  |   |            |  |  |
| 36         |                    |                   |           |                                   |                 |  | 35.5-36.2 Cemented sand, iron oxide?   |   |            |  |  |
| 37         |                    |                   |           |                                   |                 |  | Black in color, moist  |   |            |  |  |
| 38         |                    |                   |           |                                   |                 |  | 37-40 lamination of silt   |   |            |  |  |
| 39         |                    |                   |           |                                   |                 |  | -Color change at 40 ft to dark gray  |   |            |  |  |
| 40         |                    |                   |           |                                   |                 |  |  |   |            |  |  |

9/8/13 →

NOTES: Hydropunch sampler Screen interval: 26'-30' Bgs

Checked by \_\_\_\_\_ Date: \_\_\_\_\_

C-60

50WW27

**A=COM**

|                                     |  |                                       |  |
|-------------------------------------|--|---------------------------------------|--|
| Client: <u>USACE</u>                |  | BORING ID: <u>50 DPT-121</u>          |  |
| Project Number: <u>6025435</u>      |  | <u>50WW27-1</u>                       |  |
| Site Location: <u>Site 50</u>       |  | Sheet 3 of 3                          |  |
| Coordinates:                        |  | Monitoring Well Installed: <u>Yes</u> |  |
| Drilling Method: <u>DPT</u>         |  | Screened Interval:                    |  |
| Sample Type(s): <u>M. Law</u>       |  | Depth of Boring: <u>25'</u>           |  |
| Weather: <u>Sunny 99°</u>           |  | Water Level:                          |  |
| Drilling Contractor: <u>QRE/TSJ</u> |  | Date/Time Started: <u>7/23/13</u>     |  |
| Ground Elevation:                   |  | Date/Time Finished: <u>9/10/13</u>    |  |

| Depth (ft) | Geologic Sample ID | Sample Depth (ft) | Blows per ft | Recovery (inches) | Headspace (ppm) | U.S.C.S. | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID | Lab Sample Depth (ft) |
|------------|--------------------|-------------------|--------------|-------------------|-----------------|----------|--|---------------|-----------------------|
| 41         |                    |                   |              |                   |                 |          |  |               |                       |
| 42         |                    |                   |              |                   |                 |          |  |               |                       |
| 43         |                    |                   |              |                   |                 |          |  |               |                       |
| 44         |                    |                   |              |                   |                 |          |  |               |                       |
| 45         |                    |                   |              |                   |                 |          |  |               |                       |
| 46         |                    |                   |              |                   |                 |          |  |               |                       |
| 47         |                    |                   |              |                   |                 |          |  |               |                       |
| 48         |                    |                   |              |                   |                 |          |  |               |                       |
| 49         |                    |                   |              |                   |                 |          |  |               |                       |
| 50         |                    |                   |              |                   |                 |          |  |               |                       |
| 51         |                    |                   |              |                   |                 |          |  |               |                       |
| 52         |                    |                   |              |                   |                 |          |  |               |                       |
| 53         |                    |                   |              |                   |                 |          |  |               |                       |
| 54         |                    |                   |              |                   |                 |          |  |               |                       |
| 55         |                    |                   |              |                   |                 |          |  |               |                       |
| 56         |                    |                   |              |                   |                 |          |  |               |                       |
| 57         |                    |                   |              |                   |                 |          |  |               |                       |
| 58         |                    |                   |              |                   |                 |          |  |               |                       |
| 59         |                    |                   |              |                   |                 |          |  |               |                       |
| 60         |                    |                   |              |                   |                 |          |  |               |                       |

NOTES: Driller believes lignite layer is about a foot thick (53'-54'). 2 inches recovered in spoon.

End of boring @ 60 ft.

Checked by:

Date:

| Date | Time | Depth to groundwater while drilling |
|------|------|-------------------------------------|
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |
|      |      |                                     |

00954176

|  |                    |                   |              | Client: <b>USACE</b><br>Project Number: <b>60256135</b><br>Site Location: <b>LHAAP SITE 50</b><br>Coordinates: _____<br>Elevation: _____<br>Drilling Method: <b>HSA</b><br>Sample Type(s): <b>5' CONE BORED</b><br>Boring Diameter: <b>8" 10/14</b><br>Logged By: <b>GH KGM</b><br>Date/Time Started: <b>5/1/14</b><br>Date/Time Finished: <b>5/6/14</b><br>Ground Elevation: _____<br>Weather: <b>Sunny 68°</b><br>Drilling Contractor: <b>FUGRO</b> |                 |               |  | <b>BORING ID:</b><br><b>50 DPT 14 / 50WW28</b><br>Sheet 1 of 2<br>Monitoring Well Installed: <b>YES</b><br>Screened Interval: <b>13.9 - 23.9</b><br>Depth of Boring: <b>24.3</b><br>Water Level: <b>14.1</b> 5/1/14 |                       |  |  |
|---|--------------------|-------------------|--------------|---|-----------------|---------------|--|---|-----------------------|--|--|
| Depth (ft)  | Geologic Sample ID | Sample Depth (ft) | Blows per 6" | Recovery (inches)   | Headspace (ppm) | U.S.C.        | MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (if known) | Lab Sample ID   | Lab Sample Depth (ft) |  |  |
| 1   |                    |                   |              |   |                 |               |  |   |                       |  |  |
| 2   |                    |                   |              | 36" / 36"   | 5.1             | mc / sm       | SANDY SILT / SILTY FINE SAND, DARK BROWN, MOIST TO WET w/ DEPTH  |   |                       |  |  |
| 3   |                    |                   |              |   | 6.1             |               | 0.1' GRAYISH BROWN   |   |                       |  |  |
| 4   |                    |                   |              | 51" / 60"   |                 |               |  |   |                       |  |  |
| 5   |                    |                   |              |   |                 |               | 0.4.5' MOIST   |   |                       |  |  |
| 6   |                    |                   |              |   | 7.0             |               |  |   |                       |  |  |
| 7   |                    |                   |              |   |                 | SP            | 0.6' FINE SAND, LIGHT GRAY w/ YELLOWISH BROWN STAINES, DAMP  |   |                       |  |  |
| 8   |                    |                   |              |   | 5.2             | <del>SP</del> |  |   |                       |  |  |
| 9   |                    |                   |              |   |                 | SP            |  |   |                       |  |  |
| 10  |                    |                   |              | 60" / 60"   | 5.7             |               | 0.9' SILTY CLAY (GRAN) w/ LAMINATIONES OF SILT (LIGHT GRAY), DAMP, VERY STIFF  |   |                       |  |  |
| 11  |                    |                   |              |   |                 | CL            |  |   |                       |  |  |
| 12  |                    |                   |              |   | 5.7             |               |  |   |                       |  |  |
| 13  |                    |                   |              |   |                 |               |  |   |                       |  |  |
| 14  |                    |                   |              |   | 4.8             |               | 0.14.5' FINE SAND, STONY BROWN, WET  |   |                       |  |  |
| 15  |                    |                   |              | 60" / 60"   |                 |               |  |   |                       |  |  |
| 16  |                    |                   |              |   | 5.3             | SP            | 0.16' GRAN w/ STONY BROWN STAINES  |   |                       |  |  |
| 17  |                    |                   |              |   |                 |               |  |   |                       |  |  |
| 18  |                    |                   |              |   | 4.4             |               | CONTINUOUS DRILLING TO 24.3' 5/6/14  |   |                       |  |  |
| 19  |                    |                   |              |   |                 |               | SANDY CUTTINGS WERE OBSERVED WHILE DRILLING  |   |                       |  |  |
| 20  |                    |                   |              |   |                 |               |  |   |                       |  |  |

NOTES: @ 1450 ON 5/1/14 WATER SAMPLE  
50 DPT 14 (13-18) 010514 WAS OBTAINED

| Date   | Time | Depth to groundwater while drilling |
|--------|------|-------------------------------------|
| 5/1/14 | 1440 | 14.1                                |
|        |      |                                     |
|        |      |                                     |
|        |      |                                     |
|        |      |                                     |

Checked by: **Glenn Hilton** Date: **7/9/14**

00954177





HOLE NO. LHS-MW52

| DRILLING LOG   |       | DIVISION  | INSTALLATION   |                         | SHEET                   |   |
|--|-------|-----------|--|-------------------------|-------------------------|---|
|  |       | SOUTHWEST | LHAAP  |                         | 1<br>OF 1 SHEETS        |   |
| 1. PROJECT<br>LHAAP-WASTE SUMPS  |       |           | 10. SIZE AND TYPE OF BIT 8" AUGER  |                         |                         |   |
| 2. LOCATION (Coordinates or Station)<br>6958449.80 3308619.60  |       |           | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)<br>MSL                              |                         |                         |   |
| 3. DRILLING AGENCY<br>TULSA DISTRICT COE   |       |           | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>FALING 1500                         |                         |                         |   |
| 4. HOLE NO. (As shown on drawing title and file number)<br>LHS-MW52  |       |           | 13. OVERBURDEN SAMPLES   |                         | DISTURBED 8             | UNDISTURBED 0   |
| 5. NAME OF DRILLER<br>RAY VOIS   |       |           | 14. TOTAL NUMBER CORE BOXES<br>0   |                         |                         |   |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |       |           | 15. ELEVATION GROUND WATER<br>NOT DETERMINED                                   |                         |                         |   |
| 7. THICKNESS OF OVERBURDEN 22.0  |       |           | 16. DATE HOLE  |                         | STARTED 09/00/1994      | COMPLETED 09/00/1994  |
| 8. DEPTH DRILLED INTO ROCK 0.0   |       |           | 17. ELEVATION TOP OF HOLE<br>202.5   |                         |                         |   |
| 9. TOTAL DEPTH OF HOLE 22.0  |       |           | 18. TOTAL CORE RECOVERY FOR BORING<br>0.0 x                                    |                         |                         |   |
| R. PETERSON  |       |           |  |                         |                         |   |
| ELEVATION  | DEPTH | LEGEND    | CLASSIFICATION OF MATERIALS<br>(Description)                                   | % CORE<br>RECOV-<br>ERY | BOX OR<br>SAMPLE<br>NO. | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)  |
| 200.5  |       |           | LEAN CLAY (CL) (0.0 - 2.0)<br>CL-ML, SANDY SILTY CLAY, BROWN,<br>WET.          |                         | J-1                     | TYPE ZONE<br>AUGER 0.0- 22.0  |
| 198.5  | 3     |           | LEAN CLAY (CL) (2.0 - 4.0)<br>WITH SAND, REDDISH BROWN,<br>MOIST.              |                         | J-2                     | SAMPLE DEPTH<br>J-1 0.0- 2.0<br>J-2 2.0- 4.0<br>J-3 4.0- 7.5<br>J-4 7.5- 10.5<br>J-5 10.5- 13.0<br>J-6 13.0- 17.0<br>J-7 17.0- 20.5<br>J-8 20.5- 22.0 |
| 195.0  | 6     |           | FAT CLAY (CH) (4.0 - 7.5)<br>WITH SAND, REDDISH BROWN, MOIST                   |                         | J-3                     |   |
| 192.0  | 9     |           | LEAN CLAY (CL) (7.5 - 10.5)<br>SANDY, REDDISH BROWN, MOIST.                    |                         | J-4                     |   |
| 182.0  | 12    |           | LEAN CLAY (CL) (10.5 - 20.5)<br>WITH SAND, BROWN TO YELLOWISH<br>BROWN, MOIST. |                         | J-5                     |   |
| 180.5  | 21    |           | FAT CLAY (CH) (20.5 - 22.0)<br>YELLOWISH BROWN, MOIST.                         |                         | J-8                     |   |
|  | 24    |           |  |                         |                         |   |
|  | 27    |           |  |                         |                         |   |
|  | 30    |           |  |                         |                         |   |

PROJECT  
LHAAP-WASTE SUMPSHOLE NO.  
LHS-MW52

WELL NO. LHS-MW52

## MONITORING WELL SHEET

PROJECT &amp; INSTALLATION:


LONGHORN ARMY AMMUNITION PLANT - SUMPS

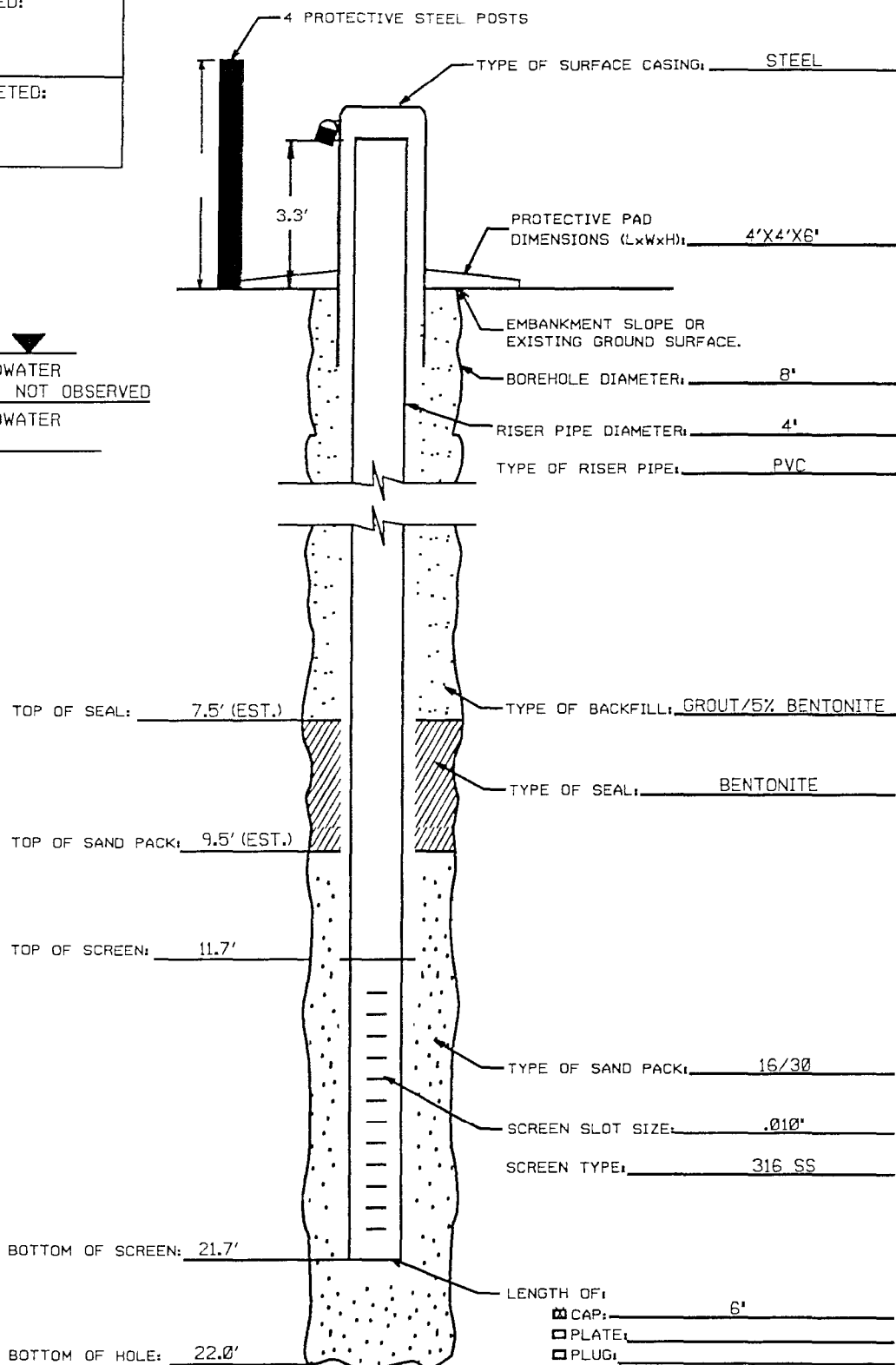
DATE STARTED:

9-1994

DATE COMPLETED:

9-1994

  
 GROUNDWATER  
 DEPTH: NOT OBSERVED  
 GROUNDWATER  
 DATE: \_\_\_\_\_



INSPECTOR:

RICHARD PETERSON



HOLE NO. LHS-MW53

| DRILLING LOG   |       | DIVISION  | INSTALLATION   | SHEET                   |                         |   |
|--|-------|-----------|--|-------------------------|-------------------------|---|
|  |       | SOUTHWEST | LHAAP  | 1                       | 1                       |   |
| 1. PROJECT LHAAP-WASTE SUMPS   |       |           | 10. SIZE AND TYPE OF BIT 8" AUGER                                      |                         |                         |   |
| 2. LOCATION (Coordinates or Station)<br>8958095.80 3309905.00  |       |           | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL                         |                         |                         |   |
| 3. DRILLING AGENCY TULSA DISTRICT COE  |       |           | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>FALLING 1500                |                         |                         |   |
| 4. HOLE NO. (As shown on drawing title and file number)<br>LHS-MW53  |       |           | 13. OVERBURDEN SAMPLES<br>DISTURBED 7 UNDISTURBED 0                    |                         |                         |   |
| 5. NAME OF DRILLER TOM BEAVERS   |       |           | 14. TOTAL NUMBER CORE BOXES 0  |                         |                         |   |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |       |           | 15. ELEVATION GROUND WATER NOT DETERMINED                              |                         |                         |   |
| 7. THICKNESS OF OVERBURDEN 14.0  |       |           | 16. DATE HOLE<br>STARTED 09/20/1994 COMPLETED 09/20/1994               |                         |                         |   |
| 8. DEPTH DRILLED INTO ROCK 0.0   |       |           | 17. ELEVATION TOP OF HOLE 195.0  |                         |                         |   |
| 9. TOTAL DEPTH OF HOLE 14.0  |       |           | 18. TOTAL CORE RECOVERY FOR BORING 0.0 %                               |                         |                         |   |
|  |       |           | JO CAMRUD  |                         |                         |   |
| ELEVATION  | DEPTH | LEGEND    | CLASSIFICATION OF MATERIALS<br>(Description)                           | % CORE<br>RECOV-<br>ERY | BOX OR<br>SAMPLE<br>NO. | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)  |
|  |       |           | SILT (ML) (0.0 - 3.0)<br>SANDY, BROWN.                                 |                         |                         | SAMPLE TYPE ZONE<br>AUGER 0.0- 8.0<br>SPLITSPOON 8.0- 14.0  |
| 192.0  | 2     |           |  |                         |                         | SAMPLE DEPTH<br>J-1 3.0- 5.0<br>J-2 6.0- 6.5<br>J-3 8.0- 10.0<br>J-4 10.0- 12.0<br>J-5 12.0- 13.0<br>J-6 13.0- 13.5<br>J-7 13.5- 14.0 |
| 189.5  | 4     |           | FAT CLAY (CH) (3.0 - 5.5)<br>WITH SAND, BROWN, MOIST.                  |                         | J-1                     |   |
| 187.8  | 6     |           | LEAN CLAY (CL) (5.5 - 7.2)<br>WITH SAND, GRAYISH BROWN, VERY<br>MOIST. |                         | J-2                     |   |
|  | 8     |           | FAT CLAY (CH) (7.2 - 13.0)<br>BROWN AND GRAY, MOIST TO VERY<br>MOIST.  |                         | J-3                     |   |
| 182.0  | 10    |           |  |                         | J-4                     |   |
| 181.5  | 12    |           |  |                         | J-5                     |   |
| 181.0  | 14    |           | SILT SAND (SM) (13.0 - 13.5)<br>BROWN AND GRAY, WET.                   |                         | J-6                     |   |
|  |       |           | FAT CLAY (CH) (13.5 - 14.0)<br>GRAY AND BROWN, MOIST.                  |                         | J-7                     |   |
|  | 16    |           |  |                         |                         |   |
|  | 18    |           |  |                         |                         |   |
|  | 20    |           |  |                         |                         |   |

PROJECT  
LHAAP-WASTE SUMPSHOLE NO.  
LHS-MW53

WELL NO. LHS-MW53

## MONITORING WELL SHEET

PROJECT &amp; INSTALLATION:


LONGHORN ARMY AMMUNITION PLANT - SUMPS

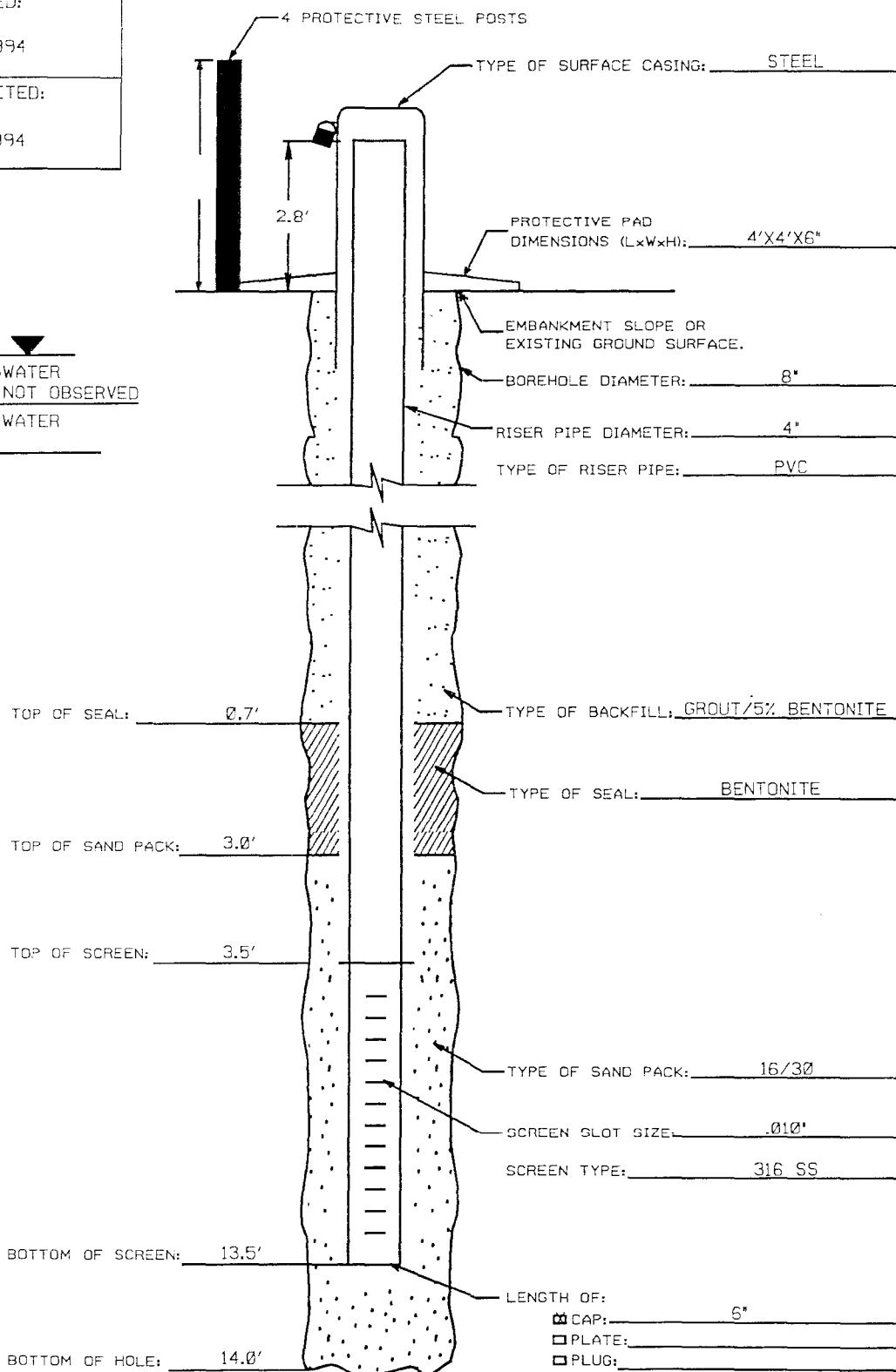
DATE STARTED:

9-20-1994

DATE COMPLETED:

9-20-1994

  
 GROUNDWATER  
 DEPTH: NOT OBSERVED  
 GROUNDWATER  
 DATE: \_\_\_\_\_



INSPECTOR:

MARYJO CAMRUD

HOLE NO. LHS-MW60

| DRILLING LOG   |       | DIVISION  | INSTALLATION   | SHEET              |                         |  |
|--|-------|-----------|--|--------------------|-------------------------|--|
|  |       | SOUTHWEST | LHAAP  | 1                  |                         |  |
| 1. PROJECT LHAAP-WASTE SUMPS   |       |           | 10. SIZE AND TYPE OF BIT 8" AUGER  |                    |                         |  |
| 2. LOCATION (Coordinates or Station)<br>6957946.00 3309450.00  |       |           | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL   |                    |                         |  |
| 3. DRILLING AGENCY TULSA DISTRICT COE  |       |           | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>FAILING 1500  |                    |                         |  |
| 4. HOLE NO. (As shown on drawing title and file number) LHS-MW60   |       |           | 13. OVERBURDEN SAMPLES DISTURBED 12 UNDISTURBED 0  |                    |                         |  |
| 5. NAME OF DRILLER RAY VOIS  |       |           | 14. TOTAL NUMBER CORE BOXES 0  |                    |                         |  |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |       |           | 15. ELEVATION GROUND WATER NOT DETERMINED  |                    |                         |  |
| 7. THICKNESS OF OVERBURDEN 27.0  |       |           | 16. DATE HOLE STARTED 09/00/1994 COMPLETED 09/00/1994  |                    |                         |  |
| 8. DEPTH DRILLED INTO ROCK 0.0   |       |           | 17. ELEVATION TOP OF HOLE 195.6  |                    |                         |  |
| 9. TOTAL DEPTH OF HOLE 27.0  |       |           | 18. TOTAL CORE RECOVERY FOR BORING 0.0 %   |                    |                         |  |
| R. PETERSON  |       |           |  |                    |                         |  |
| ELEVATION  | DEPTH | LEGEND    | CLASSIFICATION OF MATERIALS<br>(Description)   | % CORE<br>RECOVERY | BOX OR<br>SAMPLE<br>NO. | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)   |
|  |       |           | SILT (ML) (0.0 - 4.0)<br>SANDY, DARK YELLOWISH BROWN,<br>MOIST.  |                    | J-1                     | TYPE ZONE<br>AUGER 0.0- 27.0   |
| 191.6  | 3     |           |  |                    | J-2                     | SAMPLE DEPTH<br>J-1 0.0- 2.0<br>J-2 2.0- 4.0<br>J-3 4.0- 7.5<br>J-4 7.5- 8.3<br>J-5 8.3- 11.5<br>J-6 11.5- 12.3<br>J-7 12.3- 16.0<br>J-8 16.0- 19.5<br>J-9 19.5- 20.2<br>J-10 20.2- 22.3<br>J-11 22.3- 25.4<br>J-12 25.4- 27.0 |
| 188.1  | 6     |           | SILT SAND (SM) (4.0 - 7.5)<br>YELLOWISH BROWN, MOIST.  |                    | J-3                     |  |
| 187.3  | 9     |           | LEAN CLAY (CL) (7.5 - 8.3)<br>SANDY, MOIST, LIGHT GRAY AND<br>YELLOWISH BROWN WITH BROWN.                          |                    | J-4                     |  |
| 184.1  | 12    |           | LEAN CLAY (CL) (8.3 - 11.5)<br>WITH SAND, LIGHT GRAY AND<br>BROWNISH YELLOW, MOIST, IRON-<br>OXIDE STAINS.         |                    | J-5                     |  |
| 183.3  | 15    |           | CLAY SAND (SC) (11.5 - 12.3)<br>DARK YELLOWISH BROWN AND<br>YELLOWISH BROWN AND LIGHT GRAY<br>MOIST, ANGULAR ROCK. |                    | J-6                     |  |
| 179.6  | 18    |           | LEAN CLAY (CL) (12.3 - 16.0)<br>WITH SAND, LIGHT GRAY AND<br>YELLOWISH BROWN, MOIST.                               |                    | J-7                     |  |
| 176.1  | 21    |           | FAT CLAY (CH) (16.0 - 19.5)<br>LIGHT GRAY AND DARK YELLOWISH<br>BROWN, MOIST.                                      |                    | J-8                     |  |
| 175.4  | 24    |           | CLAY SAND (SC) (19.5 - 20.2)<br>LIGHT GRAY AND YELLOWISH<br>BROWN, WET, SMALL AMOUNT OF<br>BLACK STRINGERS.        |                    | J-9                     |  |
| 173.3  | 27    |           | CLAY SAND (SC) (20.2 - 22.3)<br>SC-SM, SILTY CLAYEY SAND,<br>YELLOWISH BROWN, WET.                                 |                    | J-10                    |  |
| 170.2  |       |           | CLAY SAND (SC) (22.3 - 25.4)<br>LIGHT GRAY AND YELLOWISH<br>BROWN, WET, SILTY.                                     |                    | J-11                    |  |
| 168.6  |       |           | FAT CLAY (CH) (25.4 - 27.0)<br>WITH SAND, YELLOWISH RED AND<br>LIGHT GRAY, DAMP.                                   |                    | J-12                    |  |

PROJECT  
LHAAP-WASTE SUMPSHOLE NO.  
LHS-MW60

WELL NO. LHS-MW60

## MONITORING WELL SHEET

PROJECT &amp; INSTALLATION:

LONGHORN ARMY AMMUNITION PLANT - SUMPS

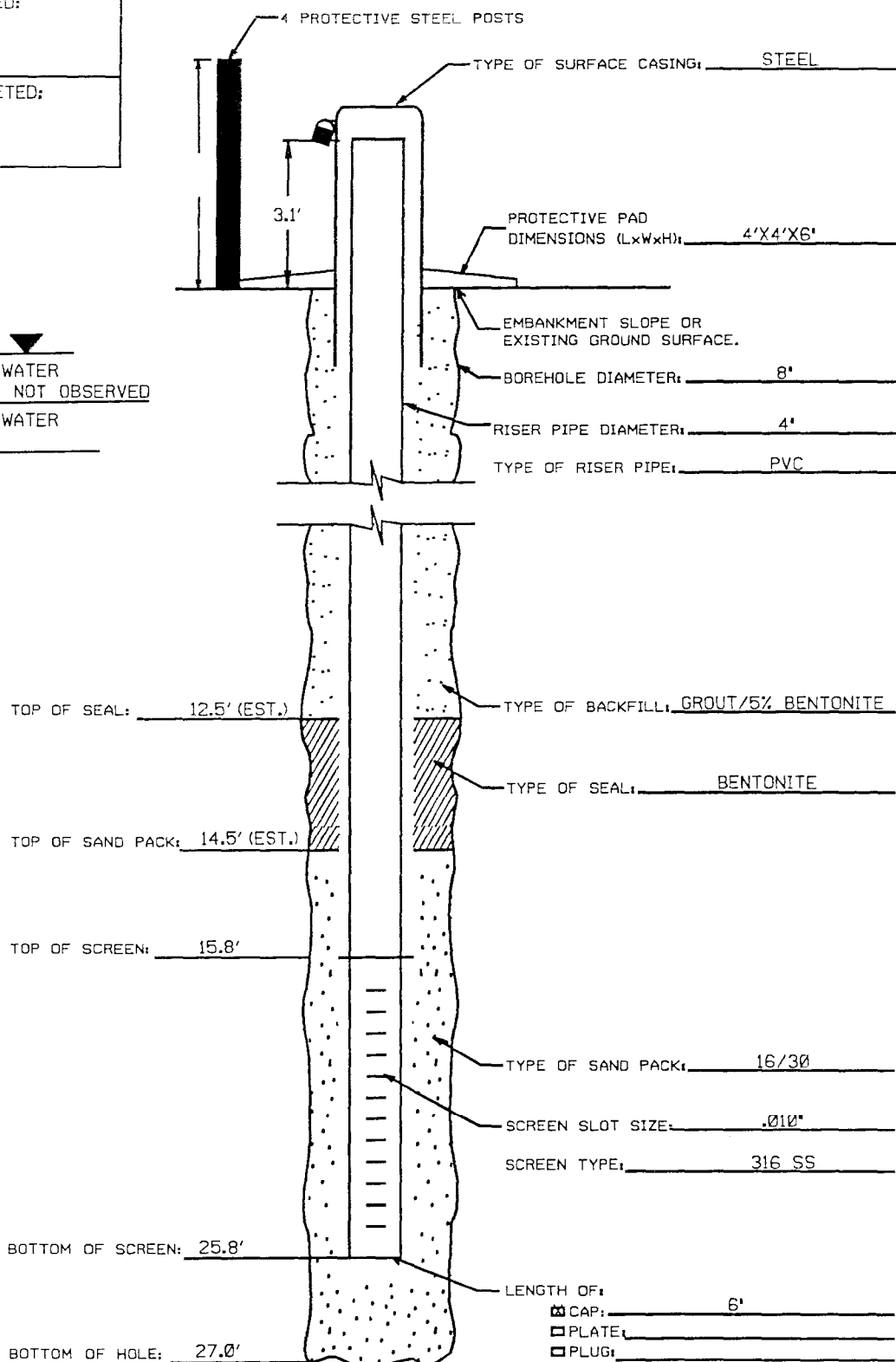
DATE STARTED:

9-1994

DATE COMPLETED:

9-1994

GROUNDWATER  
DEPTH: NOT OBSERVED  
GROUNDWATER  
DATE: \_\_\_\_\_



INSPECTOR:

RICHARD PETERSON

Hole No. SOWW01(5)

| DRILLING LOG  |                     | DIVISION   | INSTALLATION  | SHEET                   |                                  |   |
|---|---------------------|--|---|-------------------------|----------------------------------|---|
| 1. PROJECT<br>LHAAP Group IV Phase III  |                     | USACE - Tulsa  | LHAAP - Karnack, TX   | 1 OF 2 SHEETS           |                                  |   |
| 2. LOCATION (Coordinates or Station)  |                     | 10. SIZE AND TYPE OF BIT Auger Bits  |   |                         |                                  |   |
| DRILLING AGENCY<br>GPI, Austin, TX  |                     | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)   |   |                         |                                  |   |
| 3. HOLE NO. (As shown on drawing title and file number)<br>SOWW01   |                     | 12. MANUFACTURER'S DESIGNATION OF DRILL<br>CME-75 / 3" I.D. / 5' CME / 1" O.D. HSA |   |                         |                                  |   |
| 5. NAME OF DRILLER<br>Jose Londeros   |                     | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN<br>DISTURBED: 5    UNDISTURBED: -       |   |                         |                                  |   |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED    DEG. FROM VERT. |                     | 14. TOTAL NUMBER CORE BOXES<br>N/A   |   |                         |                                  |   |
| 7. THICKNESS OF OVERBURDEN<br>Penetrated 200 ft.  |                     | 15. ELEVATION GROUND WATER<br>-  |   |                         |                                  |   |
| 8. DEPTH DRILLED INTO ROCK<br>N/A   |                     | 16. DATE HOLE<br>STARTED: 7-27-98    COMPLETED: 7-27-98                            |   |                         |                                  |   |
| 9. TOTAL DEPTH OF HOLE<br>200 ft. below grade   |                     | 17. ELEVATION TOP OF HOLE  |   |                         |                                  |   |
|   |                     | 18. TOTAL CORE RECOVERY FOR BORING<br>N/A %  |   |                         |                                  |   |
|   |                     | 19. SIGNATURE OF INSPECTOR<br>C.P.G.   |   |                         |                                  |   |
| ELEVATION<br>a  | DEPTH<br>(ft.)<br>b | LOG<br>LEGEND<br>c   | CLASSIFICATION OF MATERIALS<br>(Description)<br>d   | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f     | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|   | 1                   | SS   | 0.2' of Topsoil. Sandy silt with<br>abundant roots - Dry. Overlying -<br>Sandy silt - Lt. brown, gray<br>tan, yellowish-brown,<br>fine grained sand, trace<br>to some roots - Dry<br>(loose)                                      | 3.2'                    | SS<br>#1<br>0.0'<br>to<br>4.0'   | Commenced HSA @<br>0835<br><br>HNU Reading in sampler = 0 PPM                             |
|   | 2                   |  |   |                         |                                  |   |
|   | 3                   |  |   |                         |                                  | HNU Reading @ Augers = 0 PPM  |
|   | 4                   |  | Sandy silt - Lt. gray, Lt.<br>brown and tan, fine<br>grained sand, poorly<br>graded - Dry (stiff to<br>loose)   |                         | SS<br>#2<br>4.0'<br>to<br>9.0'   | HNU Reading in sampler = 0 PPM  |
|   | 5                   |  |   | 4.6'                    |                                  |   |
|   | 6                   |  |   |                         |                                  | HNU Reading @ Augers = 0 PPM  |
|   | 7                   |  |   |                         |                                  |   |
|   | 8                   | CL   | Silty clay - Lt. gray and<br>greenish-gray, some<br>tan with abundant reddish<br>brown and yellowish orange<br>staining and mottling, hard<br>and irregular layering (v. thin)<br>trace fine sand throughout -<br>Damp (v. stiff) |                         | SS<br>#3<br>9.0'<br>to<br>14.0'  | HNU Reading in sampler = 0 PPM<br><br>HNU Reading @ Augers = 0 PPM                        |
|   | 9                   |  |   |                         |                                  |   |
|   | 10                  |  |   |                         |                                  |   |
|   | 11                  |  |   |                         |                                  |   |
|   | 12                  | SC   | Sand - clay - Lt. gray and<br>light brown, fine grained<br>sand, some silty plastic, silty<br>poorly sorted sand - wet<br>to saturated @ 12.4'  | 5.0'                    | SS<br>#4<br>14.0'<br>to<br>19.0' | HNU Reading in sampler = 0 PPM<br><br>HNU Reading @ Augers = 0 PPM                        |
|   | 13                  | CL   | Silty clay - Lt. gray and<br>greenish-gray, some tan,<br>with abundant yellowish-<br>brown mottling and staining,<br>plastic, some fine sand -<br>Damp (stiff)  |                         |                                  |   |
|   | 14                  |  |   |                         |                                  |   |
|   | 15                  |  |   |                         |                                  |   |
|   | 16                  | SC   | Clayey sand - Lt. brown and<br>gray, some tan (mottled)<br>fine grained sand, some<br>v. silty, poorly sorted,<br>some silty plastic - saturated (loose)  | 5.0'                    | SS<br>#5<br>19.0'<br>to<br>20.0' | HNU Reading in sampler = 0 PPM<br><br>HNU Reading @ Augers = 0 PPM                        |
|   | 17                  | CL   | Silty clay - Lt. to med. gray,<br>brown, tan, orange-brown, and<br>rust colored mottled, streaked,<br>stained and layered (v. thin)<br>trace to some fine sand,<br>v. plastic - Damp (v. stiff)                                   |                         |                                  |   |
|   | 18                  |  |   |                         |                                  |   |
|   | 19                  |  |   |                         |                                  |   |
|   | 20                  |  |   | 1.0'                    |                                  | HNU Reading in sampler = 0 PPM<br>HNU Reading @ Augers = 0 PPM                            |

| DRILLING LOG (Cont Sheet) |            | ELEVATION TOP OF HOLE |   | Hole No. 50W401(5)           |  |
|---------------------------|------------|-----------------------|---|------------------------------|--|
| PROJECT                   |            | INSTALLATION          |   | SHEET 2 OF 2 SHEETS          |  |
| ELEVATION<br>a            | DEPTH<br>b | LEGEND<br>c           | CLASSIFICATION OF MATERIALS<br>(Description)<br>d           | % CORE<br>RECOV.<br>ERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f   |
|                           |            |                       | T.O. @ 20.0 ft. below<br>grade in damp silty clay<br>@ 0910 |                              | T.O. @ 20' below grade<br>0940 overcilled pilot<br>hole with plugged<br>(Enviropug) 11" O.D. Auger<br>to 20.0 ft. for 4"<br>SS mon. well install.<br><br>Bent. / cement Grout 5' to grade<br>Bent. seal 8'-5'<br>Sugar Sand (30-70) 9'-8'<br>Primary filter pack 20'-9'<br>(16-30)<br>4" SS #10 s/bt screen 20'-10'<br>T.O. - 20.0 below grade |

| DRILLING LOG   |                     | DIVISION           |   | INSTALLATION  |                                  | SHEET   |  |
|--|---------------------|--------------------|---|---|----------------------------------|---|--|
|  |                     | WACE - Tulsa       |   | LHAAP - Karnack, TX   |                                  | 1 OF 1 SHEETS   |  |
| 1. PROJECT<br><u>LHAAP Group II Phase III</u>  |                     |                    |   | 10. SIZE AND TYPE OF BIT <u>Auger 6"ts</u>  |                                  |   |  |
| 2. LOCATION (Coordinates or Station)   |                     |                    |   | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)  |                                  |   |  |
| DRILLING AGENCY<br><u>GPI Inc - Austin, TX</u>   |                     |                    |   | 12. MANUFACTURER'S DESIGNATION OF DRILL<br><u>CME-75/5 CME Cont. sampler 3/4" I.D. H&amp;A 11" O.D. H&amp;A</u> |                                  |   |  |
| HOLE NO. (As shown on drawing title and file number)<br><u>50WW02</u>  |                     |                    |   | 13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN<br>DISTURBED <u>—</u> UNDISTURBED <u>—</u>                           |                                  |   |  |
| 5. NAME OF DRILLER<br><u>Jose Londeros</u>   |                     |                    |   | 14. TOTAL NUMBER CORE BOXES <u>N/A</u>  |                                  |   |  |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |                     |                    |   | 15. ELEVATION GROUND WATER  |                                  |   |  |
| 7. THICKNESS OF OVERBURDEN <u>Penetrated 19 ft.</u>  |                     |                    |   | 16. DATE HOLE<br>STARTED <u>7-25-98</u> COMPLETED <u>7-26-98</u>  |                                  |   |  |
| 8. DEPTH DRILLED INTO ROCK <u>N/A</u>  |                     |                    |   | 17. ELEVATION TOP OF HOLE   |                                  |   |  |
| 9. TOTAL DEPTH OF HOLE <u>19.0' ft. below grade</u>  |                     |                    |   | 18. TOTAL CORE RECOVERY FOR BORING <u>N/A</u> %   |                                  |   |  |
|  |                     |                    |   | 19. SIGNATURE OF INSPECTOR <u>CRS</u>   |                                  |   |  |
| ELEVATION<br>a   | DEPTH<br>(ft.)<br>b | LOG<br>LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d   | % CORE<br>RECOVERY<br>e   | BOX OR<br>SAMPLE<br>NO.<br>f     | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g           |  |
|  | 1                   | F:11               | Fill - Dark brown and<br>Reddish brown silty clay,<br>silty sand and sandy silt<br>with abundant fine to<br>coarse gravel, trace<br>Asphalt Frag - Dry  | 2.5'  | SS<br>#1<br>0.0'<br>to<br>4.0'   | Commenced H&A 7" O.D.<br>pilot hole @ 1330<br><br>H&A Reading @ sampler = open                      |  |
|  | 2                   |                    |   |   |                                  |   |  |
|  | 3                   | CL                 | - Silty clay - Dark brown<br>and reddish-brown some<br>orange-brown silt<br>lamination - Dry to damp<br>(stiff)   |   | SS<br>#2<br>4.0'<br>to<br>9.0'   | H&A Reading @<br>Augers = open  |  |
|  | 4                   |                    |   |   |                                  |   |  |
|  | 5                   |                    |   |   |                                  |   |  |
|  | 6                   |                    | - Clayey silt - Lt. to med.<br>gray with some orange brown<br>and reddish-brown mottling,<br>streaking and staining,<br>abundant U. thinning silt<br>and fine sandy silt in<br>layers. sl. plastic - Dry<br>to damp (mod. stiff)<br>(re. silt and sand content<br>with depth) | 4.0'  | SS<br>#3<br>9.0'<br>to<br>14.0'  | H&A Reading @ sampler =<br>open<br><br>(clay "mounds" visible in<br>hand [moisture]<br>below 8 ft.) |  |
|  | 7                   |                    |   |   |                                  |   |  |
|  | 8                   |                    |   |   |                                  |   |  |
|  | 9                   |                    |   |   |                                  |   |  |
|  | 10                  |                    | - Clay silt / silty clay - Lt.<br>greenish-gray, tan and<br>gray with some reddish<br>brown streaking and<br>staining, trace to some<br>fine sand throughout,<br>plastic - Damp to moist (stiff)  | No<br>Rec.<br>(logged<br>cuttings)  | SS<br>#4<br>14.0'<br>to<br>19.0' | H&A Reading @ sampler =<br>N/A<br>H&A Reading @ augers = open                                       |  |
|  | 11                  |                    |   |   |                                  |   |  |
|  | 12                  |                    |   |   |                                  |   |  |
|  | 13                  |                    |   |   |                                  |   |  |
|  | 14                  |                    |   |   |                                  |   |  |
|  | 15                  |                    | - Silty clay - Lt. gray and<br>sl. greenish-gray with some<br>to abundant reddish and<br>orange-brown streaking,<br>staining and mottling, some<br>fine sand throughout and occ<br>n U. thin lenses, trace<br>roots - Damp to moist - silty<br>wet along fine sands (stiff)   | 5.0'  | SS<br>#A<br>14.0'<br>to<br>19.0' | H&A Reading @ sampler =<br>open   |  |
|  | 16                  |                    |   |   |                                  |   |  |
|  | 17                  |                    |   |   |                                  |   |  |
|  | 18                  |                    |   |   |                                  |   |  |
|  | 19                  |                    |   |   |                                  |   |  |
|  | 20                  |                    | T.O. @ 19.0' below grade<br>in silty clay @ 1430  |   |                                  | Water @ base of hole<br>(open) after 15 min.  |  |

| DRILLING LOG (Cont Sheet)               |            | ELEVATION TOP OF HOLE                   |   | Hole No. <u>SDU402</u>            |                              |   |
|---|------------|---|---|-----------------------------------|------------------------------|---|
| PROJECT <u>LHAAP Group II Phase III</u> |            | INSTALLATION <u>LHAAP - Karnack, TX</u> |   | SHEET <u>2</u> OF <u>2</u> SHEETS |                              |   |
| ELEVATION<br>a                          | DEPTH<br>b | LEGEND<br>c                             | CLASSIFICATION OF MATERIALS<br>(Description)<br>d | % CORE<br>RECOVERY<br>e           | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g   |
|   |            |   |   |                                   |                              | Overdrilled pilot<br>hole with 11" O.D.<br>plugged HSA - Installed<br>4" SS mon. well<br>Casing 4.5' to surface<br>Bent. gen 7.5' - 8.5'<br>Sugar Sand (30-40) 8.5' - 7.5'<br>Primary Sand (16-30) 7.5' - 8.5'<br>4" SS slot screen 19' - 9'<br>T.D. hole 19' below grade |



Hole No. 50WU03(9)

|   |  |   |   |                                  |
|---|--|---|---|----------------------------------|
| <b>DRILLING LOG</b>   |  | <b>DIVISION</b><br>USACE - Tulsa  | <b>INSTALLATION</b><br>LHAAP - Kamack, TX | <b>SHEET</b><br>1<br>OF 2 SHEETS |
| <b>1. PROJECT</b><br>LHAAP Group II Site 50   |  | <b>10. SIZE AND TYPE OF BIT</b><br>Auger Bits   |   |                                  |
| <b>2. LOCATION (Coordinates or Station)</b><br>LHAAP Group II Phase III Site 50   |  | <b>11. DATUM FOR ELEVATION SHOWN (TBM or MSL)</b>   |   |                                  |
| <b>3. DRILLING AGENCY</b><br>GPI, Inc. Austin, TX   |  | <b>12. MANUFACTURER'S DESIGNATION OF DRILL</b><br>CME-75 / 3/4" ME 3/4" O.D. HST 11" O.D. HSA |   |                                  |
| <b>HOLE NO. (As shown on drawing title and file number)</b><br>50WU03   |  | <b>13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN</b><br>5  |   |                                  |
| <b>5. NAME OF DRILLER</b><br>Jose Lunderos  |  | <b>14. TOTAL NUMBER CORE BOXES</b><br>N/A   |   |                                  |
| <b>6. DIRECTION OF HOLE</b><br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |  | <b>15. ELEVATION GROUND WATER</b><br>-  |   |                                  |
| <b>7. THICKNESS OF OVERBURDEN</b><br>Penetrated 20.0 ft   |  | <b>16. DATE HOLE</b><br>7-26-98   |   |                                  |
| <b>8. DEPTH DRILLED INTO ROCK</b><br>N/A  |  | <b>17. ELEVATION TOP OF HOLE</b>  |   |                                  |
| <b>9. TOTAL DEPTH OF HOLE</b><br>20.0 below grade   |  | <b>18. TOTAL CORE RECOVERY FOR BORING</b><br>N/A %  |   |                                  |
|   |  | <b>19. SIGNATURE OF INSPECTOR</b><br>C. Fa CPG  |   |                                  |

| ELEVATION<br>a | DEPTH<br>(ft)<br>b | USE<br>LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d  | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|----------------|--------------------|--------------------|--|-------------------------|------------------------------|---|
|                | 1                  | SM                 | - Sandy silt - Lt. gray, lt. brown and tan, fine grained sand, poorly graded, trace roots - Dry to damp (mod. stiff to soft)   | 4.0'                    | SS #1<br>0.0' to 4.0'        | Commenced HSA = 3 1/4" I.D. HSA's @   |
|                | 2                  |                    |  |                         |                              | HNU Reading @ Sample = (10.2 cu PSD) 0 ppm  |
|                | 3                  | CL                 | - Silty clay - Lt. to med. gray, abundant reddish-brown and yellow-brown mottling and staining, some fine sand, trace roots - Some damp to generally moist plastic (stiff)   |                         |                              | HNU Reading @ Augers = 0 ppm  |
|                | 4                  |                    |  |                         |                              |   |
|                | 5                  |                    |  |                         | SS #2<br>4.0' to 9.0'        | HNU Reading @ Sample = 0 ppm  |
|                | 6                  |                    | - Silty clay - Lt. to med. gray - brown and orange-brown and yellow-brown mottled streaked and stained, Tr. fine sand and roots - damp   | 4.5'                    |                              | HNU Reading @ Augers = 0 ppm  |
|                | 7                  |                    |  |                         |                              |   |
|                | 8                  | SC                 | Sandy clay - Lt. gray to tan and orange-brown (mottled), fine grained sand, silty plastic - moist  |                         |                              |   |
|                | 9                  | CL                 |  |                         |                              |   |
|                | 10                 |                    | - Silty clay - Lt. gray and greenish gray with abundant yellowish-orange and reddish-brown staining, some black colored root-like structures, some fine sand - damp to pred. moist (v. stiff)                            |                         | SS #3<br>9.0' to 14.0'       | HNU Reading @ Sample = 0 ppm  |
|                | 11                 |                    |  |                         |                              | HNU Reading @ Augers = 0 ppm  |
|                | 12                 |                    | * (Some vis H <sub>2</sub> O around horis. breaks - all thin silt and sand)  |                         |                              |   |
|                | 13                 |                    | - Silty clay - Lt. gray and greenish-gray with abundant yellowish-orange mottling and staining, some black root-like structures throughout sample, trace to some fine sand - moist to wet along with silt/breaks (stiff) |                         | SS #4<br>14.0' to 19.0'      | (* Trace "solvent" like odor from sample #4)  |
|                | 14                 |                    |  |                         |                              | HNU Reading @ Sample = 0 ppm  |
|                | 15                 |                    | - Silty clay - Lt. gray and greenish-gray with yellowish-orange staining and some (Sto 15%) black root-like structures - moist   | 5.0'                    |                              | HNU Reading @ Augers = 0 ppm  |
|                | 16                 |                    |  |                         |                              |   |
|                | 17                 |                    | (Vis. H <sub>2</sub> O in sample - all horis. root breaks - all 1/2" to 1" of sample #4) - @ 20.0' (at CMP T.D. in Silt/clay (as above))   | 1.0'                    | SS #5<br>19.0' to 20.0'      | HNU Reading @ Sample = 0 ppm  |
|                | 18                 |                    |  |                         |                              | HNU Reading @ Augers = 101 ppm  |
|                | 19                 |                    |  |                         |                              |   |
|                | 20                 |                    |  |                         |                              |   |

| DRILLING LOG (Cont Sheet)                 |            |             | ELEVATION TOP OF HOLE                             |                              | Hole No. <u>SDUW03</u>               |  |
|---|------------|-------------|---|------------------------------|--------------------------------------|--|
| PROJECT <u>Group II Phase III Site 55</u> |            |             | INSTALLATION <u>CHAAP-Kurnut TX</u>               |                              | SHEET <u>2</u><br>OF <u>2</u> SHEETS |  |
| ELEVATION<br>a                            | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d | % CORE<br>RECOV.<br>ERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f         | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g  |
|   |            |             |   |                              |                                      | <p>- Pulled Augers up 10ft and waiting on water in open hole @ 0950</p> <p>- 1019 was @ 16.2' in open hole</p> <p>• Overdrilled 7" pilot hole with plugged 11" O.D. HSA to 20' for 4" SS Well installation</p> <p>- Boy cement Grout 5' to grade</p> <p>- Bent seal 8' - 5'</p> <p>- Sugar sand (30-70) 9' - 8'</p> <p>- Primary Sand (16-30) 20' - 9'</p> <p>- 4" SS #10 slot screen 20' - 10'</p> <p>- F.O. - 20.0' below grade with 11" OD Augers</p> |

Hole No. SOWW04

|   |  |   |  |                                  |
|---|--|---|--|----------------------------------|
| <b>DRILLING LOG</b>   |  | <b>DIVISION</b><br>USACE - T&E  | <b>INSTALLATION</b><br>LHAAP - Kinnick, TX | <b>SHEET</b><br>1<br>OF 2 SHEETS |
| <b>1. PROJECT</b><br>LHAAP Group IV Phase III   |  | <b>10. SIZE AND TYPE OF BIT</b> (Auger Bits)  |  |                                  |
| <b>2. LOCATION</b> (Coordinates or Station)   |  | <b>11. DATUM FOR ELEVATION SHOWN</b> (TBM or MSL)   |  |                                  |
| <b>DRILLING AGENCY</b><br>GPI - Austin TX   |  | <b>12. MANUFACTURER'S DESIGNATION OF DRILL</b><br>CME-75 / 3 1/2" I.D. HSA / Sonotube / HSA |  |                                  |
| <b>HOLE NO.</b> (As shown on drawing title and file number)<br>SOWW04   |  | <b>13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN</b><br>DISTURBED: 5<br>UNDISTURBED: -         |  |                                  |
| <b>5. NAME OF DRILLER</b><br>Jose Lombreros   |  | <b>14. TOTAL NUMBER CORE BOXES</b><br>N/A   |  |                                  |
| <b>6. DIRECTION OF HOLE</b><br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED _____ DEG. FROM VERT. |  | <b>15. ELEVATION GROUND WATER</b>   |  |                                  |
| <b>7. THICKNESS OF OVERBURDEN</b><br>Penetrated 20 ft.  |  | <b>16. DATE HOLE</b><br>STARTED: 7-26-98<br>COMPLETED: 7-27-98                              |  |                                  |
| <b>8. DEPTH DRILLED INTO ROCK</b><br>N/A  |  | <b>17. ELEVATION TOP OF HOLE</b>  |  |                                  |
| <b>9. TOTAL DEPTH OF HOLE</b><br>20.0 ft. Below Grade   |  | <b>18. TOTAL CORE RECOVERY FOR BORING</b><br>N/A %  |  |                                  |
|   |  | <b>19. SIGNATURE OF INSPECTOR</b><br>[Signature] C. K. GUE                                  |  |                                  |

| ELEVATION<br>a | DEPTH<br>(ft)<br>b | USE<br>LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d  | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|----------------|--------------------|--------------------|--|-------------------------|------------------------------|---|
|                | 1                  | SM                 | Sandy silt - Lt. gray, Lt. brown, w/ tan. Fine grain sand, poorly sorted, trace to some roots - Dry (stiff)  | 4.0'                    | SS #1                        | commenced T.O.D. HSA @ 14.5   |
|                | 2                  |                    |  |                         | 0.0' to 4.0'                 | HNU Reading in sampler = open   |
|                | 3                  |                    | (Clay content inc.)  |                         |                              | HNU Reading @ Augers = open   |
|                | 4                  | CL                 | Silty clay - Med. Reddish brown with Lt. to med. gray mottling, some small black specks throughout, trace to some fine sand, trace roots, plastic - Moist (stiff)                              | 5.0'                    | SS #2                        | HNU Reading in sampler = open   |
|                | 5                  |                    |  |                         | 4.0' to 9.0'                 | HNU Reading @ Augers = open   |
|                | 6                  |                    |  |                         |                              |   |
|                | 7                  |                    |  |                         |                              |   |
|                | 8                  |                    |  |                         |                              |   |
|                | 9                  | SC                 | Sandy clay - Lt. gray to med. gray, tan, orange-brown, w/ yellowish-orange (mottled) fine grained sand, sl. plastic throughout in some clayey zones - Abundant sl. wet (soft to loose)         | 5.0'                    | SS #3                        | HNU Reading in sampler = open   |
|                | 10                 |                    |  |                         | 9.0' to 14.0'                | HNU Reading @ Augers = open   |
|                | 11                 | CL                 | Silty clay - Lt. gray, greenish-gray, tan and dark gray, mottled, streaked w/ layered (v. thin), some v. thin sl. wet sandy silt lenses (horiz.), some fine sand throughout - Moist to sl. wet |                         | SS #4                        | HNU Reading in sampler = open   |
|                | 12                 |                    |  |                         | 14.0' to 17.0'               | HNU Reading @ Augers = open   |
|                | 13                 |                    |  |                         |                              |   |
|                | 14                 |                    |  |                         |                              |   |
|                | 15                 |                    |  |                         |                              |   |
|                | 16                 |                    |  |                         |                              |   |
|                | 17                 |                    |  |                         |                              |   |
|                | 18                 |                    |  |                         |                              |   |
|                | 19                 |                    |  |                         |                              |   |
|                | 20                 |                    | T.O. @ 20.0' Below grade in silty clay @ 1500  | 1.0'                    | SS #5                        | HNU Reading @ Augers = open   |

| DRILLING LOG (Cont Sheet) |            | ELEVATION TOP OF HOLE |   | Hole No. <u>50WL04</u>       |                              |  |
|---------------------------|------------|-----------------------|---|------------------------------|------------------------------|--|
| PROJECT                   |            | INSTALLATION          |   | SHEET<br>OF <u>22</u> SHEETS |                              |  |
| ELEVATION<br>a            | DEPTH<br>b | LEGEND<br>c           | CLASSIFICATION OF MATERIALS<br>(Description)<br>d | % CORE<br>RECOV.<br>ERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g  |
|                           |            |                       |   |                              |                              | <p>~1' of water @ base<br/>of borehole upon<br/>completion (T.D. @ 20.0')</p> <p>Pilot hole was overdrilled<br/>with plugged 11" HSA<br/>to 20.0' below grade,<br/>for 4" SS mon. well install.</p> <p>Bent/cement<br/>Grout 5'-grade</p> <p>Bent. seal 8'-5'</p> <p>Sugar Sand (30-70) 9'-8'</p> <p>Primary Filter Pack<br/>(16-30) 20'-9'</p> <p>4" SS #10 slot screen 20'-10'</p> <p>T.D. @ 20.0' below<br/>grade</p> |

## Printable Well Report

TRACKING# 12923

## STATE OF TEXAS WELL REPORT

OWNER: Longhorn Army Ammunition Plant ADDRESS: Hwy 134 @ Spur 449 Karnack, TX 75661

## ADDRESS OF WELL'S LOCATION:

wy 23 Spur Karnack, TX 75661

COUNTY: Harrison LATITUDE: 324042 LONGITUDE: 940822 Brand/Model of GPS: Garmin III Plus

Owner's Well Number: 50WW05 ELEVATION: Grid Number: 35 - 23 - 6

## TYPE OF WORK:

PROPOSED USE: ☒ Monitor Well ☐ Env. Soil Boring ☐ Domestic ☐ Test Well☒ New Well ☐ Replacement Well ☐ Industrial ☐ Irrigation ☐ Injection ☐ Public Supply ☐ De-watering☐ Deepening ☐ Reconditioning☐ Plugging ☐ Rig Supply If Public Supply well, were plans submitted to the TNRCC? ☐ Yes ☐ No

## WELL LOG:

## DIAMETER OF HOLE:

## DRILLING METHOD:

Date Drilling: Dia. (in.) From (ft.) To (ft.) ☐ Driven ☐ Air Hammer ☒ Hollow Stem Auger ☐ BoredStarted 9/18/2002 10.25 Surface 23 ☐ Air Rotary ☐ Cable Tool ☐ Reverse CirculationCompleted 9/18/2002 ☐ Mud Rotary ☐ Jetted ☐ Other

## BOREHOLE COMPLETION:

## CEMENTING DATA:

☐ Open Hole ☐ Underreamed ☐ Other

Cemented from 0 ft. to 7 ft. No. of sacks used 2

Cemented from ft. to ft. No. of sacks used

☐ Straight Wall ☒ Gravel Packed

Gravel Packed Interval from 10 ft. to 23 ft. Method Used Gravity

Cemented By Driller

Distance to Septic System ft.

## SURFACE COMPLETION:

## Method of Verification

☐ Specified Surface Slab Installed ☐ Pitless Adapter Used☒ Specified Steel Sleeve Installed ☐ Approved Alternative Procedure Used

## WATER LEVEL:

## PLUGGING INFO:

Static level ft. below land surface Date

☐ Well Plugged within 48 hours

Artesian Flow gpm. Date

Casing left in well: Cement/Bentonite left in well:

From (ft.) To (ft.) From (ft.) To (ft.) Cem/Bent Sacks Used:

## TYPE OF PUMP:

☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder☐ Other

Depth to pump bowls, cylinder, jet, etc.

## PACKERS:

Type

Depth

## WELL TESTS:

Type of test: ☐ Pump ☐ Bailer ☐ Jetted ☐ Estimated

Yield: gpm with ft. drawdown after hrs.

## WATER QUALITY:

Did Driller knowingly penetrate any strata which contained undesirable constituents? ☐ Yes ☒ No

## Type of water:

Depth of Strata:

Chemical Analysis made? ☐ Yes ☐ No

COMPANY NAME ETTL Engineers &amp; Consultants Inc.

WELL DRILLER'S LICENSE NO. 2126

ADDRESS 1717 E. Erwin

Tyler

TX 75702

Name as Signature Doug Hinds

Registered Driller Apprentice

Dr Comments:

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

Section 32.005 of the Texas Water Code, concerning confidential information in the Reporting of Well Logs, reads as follows:

"Each copy of a well log, other than a department copy must include the name, mailing address, and telephone number of the department. The well log shall be recorded at the time of drilling, and must show the depth, thickness, and character of the strata penetrated, the location of water-bearing strata, the depth, size and character of casing installed, and any other information required by department rule. The department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner or person for whom the well was drilled."

The last sentence specifies the means whereby you may, if you wish, assure that logs of your wells will be kept confidential. Please include the report's Tracking number on your written request.

**Texas Department of Licensing & Regulation**  
**P.O. Box 12157**  
**Austin, TX 78711**  
**512-463-7880**

**DESCRIPTION AND COLOR OF FORMATION MATERIAL**

| From (ft.) | To (ft.) | Description              |
|------------|----------|--------------------------|
| 0-4        |          | Silty sand - light brown |
| 4-10       |          | Silty - light gray       |
| 10-11      |          | Clay - light gray        |
| 11-12      |          | Sand - dark gray         |
| 12-12.5    |          | Clay - dark gray         |
| 12.5-13.25 |          | Sand - dark brown        |
| 13.25-14   |          | Clay - dark gray         |
| 14-20      |          | Silty sand - dark brown  |
| 20-20.5    |          | Clay - dark gray         |
| 20.5-23    |          | Sand - brown & orange    |

**CASING, BLANK PIPE, AND WELL SCREEN DATA**

| Dia. | New/<br>Used | Type                           | Setting From/To | Gage   |
|------|--------------|--------------------------------|-----------------|--------|
| 4    | New          | 304 Stainless Steel            | 0 - 12          |        |
| 4    | New          | 304 Stainless Steel - wirewrap | 12 - 22         | 0.010" |

|  |  |                   |   |               |  |
|--|--|-------------------|---|---------------|--|
| DRILLING LOG   |  | DIVISION<br>TULSA | INSTALLATION<br>LONGHORN AAP                            | SHEET<br>OF 2 | SHEETS   |
| 1. PROJECT<br>LHAAP PLANT WIDE PERCHLORATE   |  |                   | 10. SIZE AND TYPE OF BIT<br>12" OD HSA                  |               |  |
| 2. LOCATION (Coordinates or Station)<br>NORTH 6957581.566 EAST 3309709.464   |  |                   | 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)<br>195.2 MSL |               |  |
| 3. DRILLING AGENCY<br>STEP, INC.   |  |                   | 12. MANUFACTURERS DESIGNATION OF DRILL<br>MOBILE B-61   |               |  |
| 4. HOLE NO. (As shown on drawing title and title number)<br>50WW05   |  |                   | 13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN               |               | DISTURBED<br>UNDISTURBED<br>4                      |
| 5. NAME OF DRILLER<br>(Doug) ETTL, INC.  |  |                   | 14. TOTAL NUMBER CORE BOXES<br>—                        |               |  |
| 6. DIRECTION OF HOLE<br><input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED — DEG. FROM VERT. |  |                   | 15. ELEVATION GROUND WATER                              |               | 16. DATE HOLE<br>STARTED 9/18/02 COMPLETED 9/18/02 |
| 7. THICKNESS OF OVERBURDEN<br>—  |  |                   | 17. ELEVATION TOP OF HOLE                               |               |  |
| 8. DEPTH DRILLED INTO ROCK<br>NA   |  |                   | 18. TOTAL CORE RECOVERY FOR BORING<br>—                 |               |  |
| 9. TOTAL DEPTH OF HOLE<br>23 FT  |  |                   | 19. SIGNATURE OF INSPECTOR<br>M/R R. C. Cuts            |               |  |

| ELEVATION<br>a | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d  | % CORE<br>RECOV-<br>ERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|----------------|------------|-------------|--|------------------------------|------------------------------|---|
| 191.2          | 4          |             | SAND - 7.5 YR 6/4, VERY<br>SILTY, MOIST<br>LIGHT BROWN   |                              |                              |   |
| 185.2          | 10         |             | SILT - 7.5 YR 7/1<br>LIGHT GRAY,<br>ABUNDANT CLAY<br>DRY BECOMES MOIST<br>AT 8 FT<br>ABUNDANT ORANGE<br>IRON STAIN |                              |                              |   |
| 183.95         | 11         |             | CLAY - 7.5 YR 7/1 VERY<br>SILTY LIGHT GRAY<br>ABUNDANT IRON STAIN<br>MOIST   |                              |                              |   |
| 183.2          | 12         |             | SAND - 7.5 YR 3/4, DARK<br>BROWN, VERY SILTY, MOIST  |                              |                              |   |
|                | 13         |             | CLAY - VERY SILTY DARK<br>GRAY MOIST   |                              |                              |   |
|                | 14         |             | SAND - DARK BROWN, VERY<br>SILTY, MOIST  |                              |                              |   |
|                | 15         |             | CLAY - DARK GRAY, VERY<br>SILTY, MOIST   |                              |                              |   |
|                | 16         |             | SAND - 7.5 YR 3/4<br>SILTY, VERY MOIST<br>BECOMES WET AT<br>14 FT  |                              |                              |   |

| DRILLING LOG (Cont Sheet)              |            |             | ELEVATION TOP OF HOLE   |                         | Hole No. 50W05               |   |
|--|------------|-------------|---|-------------------------|------------------------------|---|
| PROJECT<br>LHAAP PLANT WIDE PERCLORATE |            |             | INSTALLATION<br>LONGHORN AAP  |                         | SHEET OF 2 SHEETS            |   |
| ELEVATION<br>a                         | DEPTH<br>b | LEGEND<br>c | CLASSIFICATION OF MATERIALS<br>(Description)<br>d   | % CORE<br>RECOVERY<br>e | BOX OR<br>SAMPLE<br>NO.<br>f | REMARKS<br>(Drilling time, water loss, depth of<br>weathering, etc., if significant)<br>g |
|  | 18         |             | SAND - 7.5 YR 3/4<br>DARK BROWN ABUNDANT<br>ORANGE IRON STAIN<br>BECOMES VERY WET<br>AT 18.2 FT |                         |                              |   |
|  | 19         |             |   |                         |                              |   |
| 175.2                                  | 20         |             | CLAY - 7.5 YR 4/1<br>DARK GRAY  |                         |                              |   |
|  | 21         |             | SAND - 7.5 YR 5/6<br>BROWN TO ORANGE<br>VERY SILTY ABUNDANT<br>IRON STAINED BANES<br>VERY MOIST |                         |                              |   |
|  | 22         |             |   |                         |                              |   |
| 172.2                                  | 23         |             |   |                         |                              | TOTAL DEPTH = 23 ft   |



## MONITORING WELL CONSTRUCTION LOG - Standard

|                                       |   |   |
|---------------------------------------|---|---|
| WELL NO.: <u>50W005</u>               | INSTALLATION: <u>LONGHORN AAP</u>                   | SITE: <u>LHAAP SITE 50</u>                    |
| PROJECT NO.: <u>114-109 / 114-001</u> | CLIENT/PROJECT: <u>TULSA COE, LHAAP PERCHLORATE</u> |   |
| CONTRACTOR: <u>STEP, INC</u>          | DRILLING CONTRACTOR: <u>ETTL, INC</u>               |   |
| START - DATE: <u>9/18/02</u>          | TIME: <u>09:00</u>                                  | END - DATE: <u>9/18/02</u> TIME: <u>13:00</u> |
| BUILT BY:                             | WELL COORDINATES: <u>N 6957581.56 E 3309709.464</u> |   |

Elev 198.10  
 Height 3.5  
 Elev 197.60  
 Height 3'  
 GS Elev 195.2  
 GS Height 0.00'  
 Depth BGS

PROTECTIVE CSG  
 Material/ Type HINGED LOCKING CAP STEEL  
 Diameter 8" SQUARE  
 Weep Hole ☐ Yes ☒ No  
 GUARD POSTS ☒ Yes ☐ No  
 No. 4 Type STEEL/CONCRETE FILLED  
 SURFACE PAD  
 Composition & Size CONCRETE 3'x3'x6"  
 RISER PIPE  
 Type 304 STAINLESS STEEL  
 Diameter 4"  
 Total Length (TOC to TOS) 15'  
 Ventilated Cap ☒ Yes ☐ No  
 O-Rings For Threads ☐ Yes ☒ No  
 GROUT  
 Composition & Amount TYPE I CEMENT WITH POWDERED BENTONITE  
 Tremied ☒ Yes ☐ No  
 Interval BGS 0-7'  
 CENTRALIZERS ☐ Yes ☒ No  
 Depth(s) \_\_\_\_\_  
 SEAL  
 Type PELLET BENTONITE (3/8") [2 BUCKETS]  
 Source BAROLD  
 Setup/Hydration Time 2 HR  
 Volume Fluid Added 10 GALLON  
 Tremied ☐ Yes ☒ No  
 FILTER PACK  
 Type ANSI/MSRG1-1994 (20-40)  
 Amount Used 14 BAGS  
 Tremied ☐ Yes ☒ No  
 Source \_\_\_\_\_  
 Gr Size Dist \_\_\_\_\_  
 SCREEN  
 Type 304 STAINLESS STEEL  
 Diameter 4" WIRE WRAPPED  
 Slot Size 0.01  
 Interval BGS 12' TO 22'  
 SUMP  
 Interval BGS NA  
 Type of Bottom Cap \_\_\_\_\_  
 BACKFILL PLUG  
 Material NA  
 Setup/Hydration Time \_\_\_\_\_  
 Tremied ☐ Yes ☐ No

15'  
 7'  
 3'  
 10'  
 12'  
 13'  
 10'  
 22'  
 23'  
 NA  
 23'  
 Total Depth

Borehole Dia 12"



## Drilling Log

Monitoring Well **50WW06**

Page: 1 of 2

Project Longhorn Army Ammunition Plant Owner Shaw E&I, Inc.  
 Location Karmack, Texas Proj. No. 845714  
 Surface Elev. 193.0 ft. Total Hole Depth 58.0 ft. North 6957553.93 ft East 3309790.221 ft.  
 Top of Casing 195.35 ft. Water Level Initial ▽ 13.0 ft. Static ▽ 11.9 ft. Diameter 10 in.  
 Screen: Dia 4 in. Length 10 ft. Type/Size PVC/0.01 in.  
 Casing: Dia 4 in. Length 50.35 ft. Type Sch. 40 PVC  
 Fill Material 20/40 Sand, Bentonite Grout Rig/Core Foremost 5500/5' Core Barrel  
 Drill Co. ETTL Method Hollow Stem Auger w/Mud Rotary Capabilities  
 Driller Doug Hines Log By Dale Jayne Date 8/3/04 Driller # NA  
 Checked By Kay Everett License No. NA

COMMENTS  
 APPROXIMATE DIAMETER OF  
 BOREHOLE IS 9 7/8"

| Depth<br>(ft.) | Well<br>Completion | PI/D<br>(ppm) | Sample ID<br>% Recovery | Graphic<br>Log | USCS<br>Class. | Description<br><br>(Color, Texture, Structure)<br><br>Geologic Descriptions are Based on the USCS. | Elevation<br>(ft.) |
|----------------|--------------------|---------------|-------------------------|----------------|----------------|--|--------------------|
| 0              |                    |               |                         |                |                | 4'x4'x6" Conc. Pad w/ 4" diameter bollards   | 192.99             |
| 2              |                    | 0.0           | NA<br>100%              |                |                | SILTY CLAY, PALE BROWN, SOFT, MOIST  | 192                |
| 4              |                    |               |                         |                | CL             | -LIGHT BLuish-GRAY MOTTling THROuGHOUT THE CORE  | 190                |
| 6              |                    | 0.0           | NA<br>80%               |                |                |  | 188                |
| 8              |                    |               |                         |                |                | SAND, FINE-GRAINED, SOFT, LOOSE, MOIST   | 186                |
| 10             |                    | 0.0           | NA<br>80%               |                |                | -BECOMES WET, PALE BROWN, LIGHT GREENISH-GRAY THROuGHOUT CORE                                      | 184                |
| 12             |                    |               |                         |                |                | -BECOMES YELLOW IN COLOR   | 182                |
| 14             |                    |               |                         |                |                |  | 180                |
| 16             |                    | 0.0           | NA<br>100%              |                |                | -SOME CLAY NOTICED   | 178                |
| 18             |                    |               |                         |                | SP             | -BECOMES PALE BROWN  | 176                |
| 20             |                    | 0.0           | NA<br>80%               |                |                |  | 174                |
| 22             |                    |               |                         |                |                |  | 172                |
| 24             |                    |               |                         |                |                |  | 170                |
| 26             |                    | 0.0           | NA<br>60%               |                |                |  | 168                |
| 28             |                    |               |                         |                |                |  | 166                |
| 30             |                    | 0.0           | NA<br>80%               |                |                |  | 164                |

Continued Next Page



# Drilling Log

00954199

Monitoring Well **50WW06**

Page: 2 of 2

Project Longhorn Army Ammunition PlantOwner Shaw E&I, Inc.Location Karnack, TexasProj. No. 845714

| Depth<br>(ft.) | Well<br>Completion | PID<br>(ppm) | Sample ID<br>% Recovery | Graphic<br>Log | USCS Class. | Description<br>(Color, Texture, Structure)<br>Geologic Descriptions are Based on the USCS. | Elevation<br>(ft.) |
|----------------|--------------------|--------------|-------------------------|----------------|-------------|--|--------------------|
| 30             |                    |              |                         |                |             | Continued  | 162                |
| 32             |                    | 0.0          | NA<br>80%               |                |             |  | 160                |
| 34             |                    |              |                         |                |             |  | 158                |
| 36             |                    | 0.0          | NA<br>40%               |                |             | -NO RECOVERY 35'-38'   | 156                |
| 38             |                    |              |                         |                |             | -BECOMES GREENISH-GRAY   | 154                |
| 40             |                    | 0.0          | NA<br>20%               |                |             | -NO RECOVERY 40'-43'   | 152                |
| 42             |                    |              |                         |                | SP          |  | 150                |
| 44             |                    |              |                         |                |             |  | 148                |
| 46             |                    | 0.0          | NA<br>20%               |                |             |  | 146                |
| 48             |                    |              |                         |                |             | -UNCONSOLIDATED LIGNITE NOTICED 48'-53'  | 144                |
| 50             |                    | 0.0          | NA<br>40%               |                |             |  | 142                |
| 52             |                    |              |                         |                |             |  | 140                |
| 54             |                    |              |                         |                |             |  | 138                |
| 56             |                    | 0.0          | NA<br>40%               |                | CL          | NO RECOVERY, LAST AUGER SHOWED A CLAY W/<br>LIGNITE, STIFF, SATURATED                      | 136                |
| 58             |                    |              |                         |                |             | END OF BORING  | 134                |
| 60             |                    |              |                         |                |             |  | 132                |
| 62             |                    |              |                         |                |             |  | 130                |
| 64             |                    |              |                         |                |             |  | 128                |
| 66             |                    |              |                         |                |             |  | 126                |
| 68             |                    |              |                         |                |             |  | 124                |
| 70             |                    |              |                         |                |             |  |                    |

MANCHACA Rev. 10/25/04 SITES 32 50 67 BORING LOGS GPJ 12/2/04

### STATE OF TEXAS WELL REPORT for Tracking #46655

|   |                                      |
|---|--------------------------------------|
| Owner: <b>Longhorn Army Ammunition Plant</b>                          | Owner Well #: <b>50WW06</b>          |
| Address: <b>Hwy 143 @ Spur 449, LHAAP<br/>Karnack , TX 75661</b>      | Grid #: <b>35-24-4</b>               |
| Well Location: <b>Hwy 143 @ Spur 449 LHAAP<br/>Karnack , TX 75661</b> | Latitude: <b>32° 40' 12" N</b>       |
| Well County: <b>Harrison</b>  | Longitude: <b>094° 06' 52" W</b>     |
| Elevation: <b>No Data</b>   | GPS Brand Used: <b>Garmin 12 GPS</b> |
| <hr/>   |                                      |
| Type of Work: <b>New Well</b>   | Proposed Use: <b>Monitor</b>         |

Drilling Date:      Started: **8/3/2004**  
                          Completed: **8/3/2004**

Diameter of Hole:    Diameter: **9 7/8 in From Surface To 58 ft**

Drilling Method:     **Mud Rotary Hollow Stem Auger**

Borehole  
Completion:          Gravel Packed From: **43 ft to 58 ft**  
                                  Gravel Pack Size: **20/40**

Annular Seal Data:    1st Interval: **From 35 ft to 43 ft with 2 bentonite (#sacks and material)**  
                                  2nd Interval: **From 0 ft to 35 ft with 8 cement (#sacks and material)**  
                                  3rd Interval: **No Data**  
                                  Method Used: **Tremie pipe**  
                                  Cemented By: **Driller**  
                                  Distance to Septic Field or other Concentrated Contamination: **No Data**  
                                  Distance to Property Line: **No Data**  
                                  Method of Verification: **No Data**  
                                  Approved by Variance: **No Data**

Surface  
Completion:          **Surface Slab Installed**

---

Water Level:          Static level: **No Data**  
                                  Artesian flow: **No Data**

Packers:             **No Data**

Plugging Info:        Casing or Cement/Bentonite left in well: **No Data**

Type Of Pump:        **No Data**

Well Tests:            **No Data**

---

Water Quality:        Type of Water: **No Data**  
                                  Depth of Strata: **No Data**  
                                  Chemical Analysis Made: **No Data**  
                                  Did the driller knowingly penetrate any strata which contained undesirable constituents: **No**

Certification Data:    The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the log(s) being returned for completion and resubmittal.

Company  
Information:            **ETTL Engineers & Consultants Inc.  
1717 E. Erwin**

Tyler, TX 75702

Driller License Number: **2126**

Licensed Well Driller Signature: **Doug Hinds**

Registered Driller Apprentice Signature: **No Data**

Apprentice Registration Number: **No Data**

Comments: **No Data**

**IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY**

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner of the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking number (Tracking #46655) on your written request.

**Texas Department of Licensing & Regulation**  
**P.O. Box 12157**  
**Austin, TX 78711**  
**(512) 463-7880**

**DESC. & COLOR OF FORMATION MATERIAL**

From (ft) To (ft) Description  
**0-7 Silty clay - brown & bluish gray**  
**7-58 Sand - brown, greenish gray, & yellow**

**CASING, BLANK PIPE & WELL SCREEN DATA**

| Dia. | New/Used | Type                  | Setting From/To |
|------|----------|-----------------------|-----------------|
| 4    | New      | PVC Sch. 40           | 0 - 45          |
| 4    | New      | PVC Sch. 40 - slotted | 45 - 55 0.010"  |

**ENCLOSURE 2**

**TCEQ CORE DATA FORM**



# TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

## SECTION I: General Information

|   |  |   |
|---|--|---|
| <b>1. Reason for Submission</b> (If other is checked please describe in space provided.)  |  |   |
| <input type="checkbox"/> New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.) |  |   |
| <input type="checkbox"/> Renewal (Core Data Form should be submitted with the renewal form)   |  | <input type="checkbox"/> Other                          |
| <b>2. Customer Reference Number (if issued)</b>   |  | <b>3. Regulated Entity Reference Number (if issued)</b> |
| CN  |  | RN  |

[Follow this link to search for CN or RN numbers in Central Registry\\*\\*](#)

## SECTION II: Customer Information

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| <b>4. General Customer Information</b>  |  | <b>5. Effective Date for Customer Information Updates</b> (mm/dd/yyyy) |  | 01/31/2020   |  |
| <input type="checkbox"/> New Customer <input type="checkbox"/> Update to Customer Information <input type="checkbox"/> Change in Regulated Entity Ownership                                     |  |  |  |  |  |
| <input type="checkbox"/> Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)  |  |  |  |  |  |
| <b>The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).</b> |  |  |  |  |  |
| <b>6. Customer Legal Name</b> (If an individual, print last name first: eg: Doe, John)  |  |  |  | If new Customer, enter previous Customer below:                                |  |
|   |  |  |  |  |  |
| <b>7. TX SOS/CPA Filing Number</b>  |  | <b>8. TX State Tax ID</b> (11 digits)                                  |  | <b>9. Federal Tax ID</b> (9 digits)  |  |
|   |  |  |  | <b>10. DUNS Number</b> (if applicable)   |  |
| <b>11. Type of Customer:</b>  |  | <input type="checkbox"/> Corporation                                   |  | <input type="checkbox"/> Individual  |  |
| Government: <input type="checkbox"/> City <input type="checkbox"/> County <input type="checkbox"/> Federal <input type="checkbox"/> State <input type="checkbox"/> Other                        |  | <input type="checkbox"/> Sole Proprietorship                           |  | Partnership: <input type="checkbox"/> General <input type="checkbox"/> Limited |  |
| <b>12. Number of Employees</b>  |  | <b>13. Independently Owned and Operated?</b>                           |  |  |  |
| <input type="checkbox"/> 0-20 <input type="checkbox"/> 21-100 <input type="checkbox"/> 101-250 <input type="checkbox"/> 251-500 <input type="checkbox"/> 501 and higher                         |  | <input type="checkbox"/> Yes <input type="checkbox"/> No               |  |  |  |
| <b>14. Customer Role</b> (Proposed or Actual) – as it relates to the Regulated Entity listed on this form. Please check one of the following:   |  |  |  |  |  |
| <input type="checkbox"/> Owner <input type="checkbox"/> Operator <input type="checkbox"/> Owner & Operator  |  |  |  |  |  |
| <input type="checkbox"/> Occupational Licensee <input type="checkbox"/> Responsible Party <input type="checkbox"/> Voluntary Cleanup Applicant <input type="checkbox"/> Other:                  |  |  |  |  |  |
| <b>15. Mailing Address:</b>   |  |  |  |  |  |
|   |  |  |  |  |  |
| City  |  | State  |  | ZIP  |  |
|   |  |  |  | ZIP + 4  |  |
| <b>16. Country Mailing Information</b> (if outside USA)   |  |  |  | <b>17. E-Mail Address</b> (if applicable)                                      |  |
|   |  |  |  |  |  |
| <b>18. Telephone Number</b>   |  | <b>19. Extension or Code</b>   |  | <b>20. Fax Number</b> (if applicable)  |  |
| ( ) -   |  |  |  | ( ) -  |  |

## SECTION III: Regulated Entity Information

|  |  |
|--|--|
| <b>21. General Regulated Entity Information</b> (If 'New Regulated Entity' is selected below this form should be accompanied by a permit application)                  |  |
| <input type="checkbox"/> New Regulated Entity <input type="checkbox"/> Update to Regulated Entity Name <input type="checkbox"/> Update to Regulated Entity Information |  |
| <b>The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)</b>     |  |
| <b>22. Regulated Entity Name</b> (Enter name of the site where the regulated action is taking place.)  |  |
|  |  |

|  |  |                                   |                       |  |         |  |                  |  |
|--|--|-----------------------------------|-----------------------|--|---------|--|------------------|--|
| 23. Street Address of the Regulated Entity:<br>(No PO Boxes)                                   |  |                                   |                       |  |         |  |                  |  |
|  |  |                                   |                       |  |         |  |                  |  |
|  | City   |                                   | State                 |  | ZIP     |  | ZIP + 4          |  |
| 24. County   |  |                                   |                       |  |         |  |                  |  |
| Enter Physical Location Description if no street address is provided.                          |  |                                   |                       |  |         |  |                  |  |
| 25. Description to Physical Location:  | LHAAP is located in the northeast corner of Harrison County between SH43 and the western shore of Caddo Lake |                                   |                       |  |         |  |                  |  |
| 26. Nearest City   |  |                                   |                       |  | State   |  | Nearest ZIP Code |  |
| Karnack  |  |                                   |                       |  | TX      |  | 75661            |  |
| 27. Latitude (N) In Decimal:   |  | 32.677922                         |                       | 28. Longitude (W) In Decimal:          |         | 94.140436                                |                  |  |
| Degrees  | Minutes  | Seconds                           | Degrees               | Minutes                                | Seconds |  |                  |  |
| 32   | 40   | 40.512                            | 94                    | 8                                      | 25.569  |  |                  |  |
| 29. Primary SIC Code (4 digits)  |  | 30. Secondary SIC Code (4 digits) |                       | 31. Primary NAICS Code (5 or 6 digits) |         | 32. Secondary NAICS Code (5 or 6 digits) |                  |  |
|  |  |                                   |                       |  |         |  |                  |  |
| 33. What is the Primary Business of this entity? (Do not repeat the SIC or NAICS description.) |  |                                   |                       |  |         |  |                  |  |
|  |  |                                   |                       |  |         |  |                  |  |
| 34. Mailing Address:   |  |                                   |                       |  |         |  |                  |  |
|  |  |                                   |                       |  |         |  |                  |  |
|  | City   |                                   | State                 |  | ZIP     |  | ZIP + 4          |  |
| 35. E-Mail Address:  |  |                                   |                       |  |         |  |                  |  |
| 36. Telephone Number   |  |                                   | 37. Extension or Code |  |         | 38. Fax Number (if applicable)           |                  |  |
| ( ) -  |  |                                   |                       |  |         | ( ) -                                    |                  |  |

**39. TCEQ Programs and ID Numbers** Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

|  |  |   |  |   |
|--|--|---|--|---|
| <input type="checkbox"/> Dam Safety            | <input type="checkbox"/> Districts             | <input type="checkbox"/> Edwards Aquifer        | <input type="checkbox"/> Emissions Inventory Air | <input type="checkbox"/> Industrial Hazardous Waste |
| <input type="checkbox"/> Municipal Solid Waste | <input type="checkbox"/> New Source Review Air | <input type="checkbox"/> OSSF                   | <input type="checkbox"/> Petroleum Storage Tank  | <input type="checkbox"/> PWS                        |
| <input type="checkbox"/> Sludge                | <input type="checkbox"/> Storm Water           | <input type="checkbox"/> Title V Air            | <input type="checkbox"/> Tires                   | <input type="checkbox"/> Used Oil                   |
| <input type="checkbox"/> Voluntary Cleanup     | <input type="checkbox"/> Waste Water           | <input type="checkbox"/> Wastewater Agriculture | <input type="checkbox"/> Water Rights            | <input type="checkbox"/> Other:                     |
|  |  |   |  |   |

## SECTION IV: Preparer Information

|                      |               |                |                    |            |  |  |  |
|----------------------|---------------|----------------|--------------------|------------|--|--|--|
| 40. Name:            |               |                |                    | 41. Title: |  |  |  |
| 42. Telephone Number | 43. Ext./Code | 44. Fax Number | 45. E-Mail Address |            |  |  |  |
| ( ) -                |               | ( ) -          |                    |            |  |  |  |

## SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

|                  |  |  |  |            |        |       |  |
|------------------|--|--|--|------------|--------|-------|--|
| Company:         |  |  |  | Job Title: |        |       |  |
| Name(In Print) : |  |  |  |            | Phone: | ( ) - |  |
| Signature:       |  |  |  |            | Date:  |       |  |





DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
POST OFFICE BOX 220  
RATCLIFF, AR 72951

March 2, 2020

DAIM-ODB-LO

Mr. William Rhotenberry  
U.S. Environmental Protection Agency  
Federal Facilities Section R6  
1201 Elm Street, Suite 500  
Dallas, TX 75202-2102

**Re: LHAAP-18/24 Record of Decision, December 2019  
Longhorn Army Ammunition Plant, Karnack, Texas**

Dear Mr. Rhotenberry,

Enclosed please find the December 2019 LHAAP-18/24 Record of Decision (ROD) for your records. This is the final ROD and includes the completed signature page with Army and EPA signatures, and the TCEQ concurrence.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

A handwritten signature in cursive script, reading "Rose M. Zeiler", is located below the "Sincerely," text.

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

One Enclosure  
Copies furnished:

A. Palmie, TCEQ, Austin, TX

P. Bruckwicky, Caddo Lake NWR,  
TX

P. Werner, HDR

A. Williams, USACE, Tulsa District,  
OK

A. Maly, USAEC, San Antonio, TX

K. Nemmers, Bhate

R. Smith, USACE, Tulsa District,  
OK



DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
POST OFFICE BOX 220  
RATCLIFF, AR 72951

March 2, 2020

DAIM-ODB-LO

Ms. April Palmie  
Texas Commission on Environmental Quality  
Remediation Division  
12100 Park 35 Circle, Bldg D  
Austin, TX 78753

**Re: LHAAP-18/24 Record of Decision, December 2019  
Longhorn Army Ammunition Plant, Karnack, Texas**

Dear Ms. Palmie,

Enclosed please find the December 2019 LHAAP-18/24 Record of Decision (ROD) for your records. This is the final ROD and includes the completed signature page with Army and EPA signatures, and the TCEQ concurrence.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

One Enclosure  
Copies furnished:

|                                   |  |                                     |
|-----------------------------------|--|-------------------------------------|
| W. Rhotenberry, USEPA, Dallas TX  | A. Williams, USACE, Tulsa District, OK | K. Nemmers, Bhate                   |
| P. Bruckwicki, Caddo Lake NWR, TX | A. Maly, USAEC, San Antonio, TX        | R. Smith, USACE, Tulsa District, OK |
| P. Werner, HDR                    |  |                                     |

Jon Niermann, *Chairman*  
Emily Lindley, *Commissioner*  
Bobby Janecka, *Commissioner*  
Toby Baker, *Executive Director*



## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

*Protecting Texas by Reducing and Preventing Pollution*

February 6, 2020

Mr. Thomas E. Lederle  
Chief, DCS G-9 BRAC Division  
2530 Crystal Drive, Suite 1400  
Taylor Bldg./NC3  
Arlington, VA 22202

Subject: Record of Decision for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant Federal Superfund Site TX6213820529  
Karnack, Harrison County, Texas

Dear Mr. Lederle:

The Texas Commission on Environmental Quality (TCEQ) received the final Record of Decision (ROD) for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant Federal Superfund Site in Karnack, Texas on January 9, 2020. The TCEQ has completed the review of the above referenced document and concurs that the described action is appropriate.

Sincerely,

A handwritten signature in blue ink, appearing to read "Toby Baker", written over a horizontal line.

Toby Baker  
Executive Director

cc: Ms. Wren Stenger, Director, Superfund Division, US Environmental Protection Agency,  
Region 6



*Final*

## Record of Decision

for LHAAP-18/24,  
Burning Ground No. 3 and  
Unlined Evaporation Pond  
Longhorn Army Ammunition Plant  
Karnack, Texas

December 2019

Prepared For:



U.S. Army Corps of Engineers – Tulsa District

Prepared By:

HDR

9871 S. Meridian Blvd, Suite 400  
Englewood, CO 80112

Contract No. W912BV-15-D-0014  
Task Order No. W912BV18F0023

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*Final*

**RECORD OF DECISION**

**FOR**

**LHAAP-18/24, BURNING GROUND NO. 3 AND**

**UNLINED EVAPORATION POND**

**LONGHORN ARMY AMMUNITION PLANT**

**KARNACK, TEXAS**

**Prepared For:**  
**U.S. Army Corp of Engineers Tulsa District**

**Prepared By:**  
**HDR, Inc.**  
**9871 S. Meridian Blvd, Suite 400**  
**Englewood, CO 80112**

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**December 2019**

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Appendix A: Public Notice Affidavits



# Acronyms and Abbreviations

|                                 |   |
|---------------------------------|---|
| µg/kg                           | micrograms per kilogram   |
| µg/L                            | micrograms per liter  |
| ACD                             | air curtain destructor  |
| ARAR                            | applicable or relevant and appropriate requirement                    |
| BERA                            | baseline ecological risk assessment                                   |
| bgs                             | below ground surface  |
| BHHRA                           | baseline human health risk assessment                                 |
| °C                              | degrees Celsius   |
| CDI                             | chronic daily intake  |
| CDM                             | Camp, Dresser & McKee   |
| CERCLA                          | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR                             | Code of Federal Regulations   |
| COC                             | chemical of concern   |
| COPEC                           | chemical of potential ecological concern                              |
| COPC                            | chemical of potential concern   |
| CSM                             | conceptual site model   |
| CWA                             | Clean Water Act of 1972   |
| DCE                             | dichloroethylene  |
| DNAPL                           | dense non-aqueous phase liquid  |
| DPT                             | Direct push technology  |
| ECP                             | environmental condition of property                                   |
| EEQ                             | ecological effects quotient   |
| EISB                            | Enhanced in-situ bioremediation                                       |
| EPC                             | exposure point concentration  |
| EPS                             | Environmental Protection Systems                                      |
| ERH                             | Electrical resistance heating   |
| ESD                             | Explanation of Significant Differences                                |
| EVO                             | emulsified vegetable oil  |
| FBR                             | fluidized bed reactor   |
| FFA                             | Federal Facility Agreement  |
| FS                              | Feasibility Study   |
| ft                              | feet  |
| ft <sup>2</sup>                 | square feet   |
| gpm                             | gallons per minute  |
| <sup>GW</sup> GW <sub>Ing</sub> | Tier 1 Residential Groundwater Protective Concentration Level (PCL)   |
| GWQA                            | Groundwater Quality Assessment  |
| GWP-Ind                         | TCEQ soil MSC for industrial use based on groundwater protection      |
| GWTP                            | Groundwater treatment plant   |
| HDR                             | HDR Environmental, Operations and Construction, Inc.                  |
| HEAST                           | Health Effects Assessment Summary Tables                              |
| HI                              | hazard index  |
| HQ                              | hazard quotient   |
| ICT                             | interceptor-collection trench   |
| IRA                             | Interim Remedial Action   |
| IRIS                            | Integrated Risk Information System                                    |
| ISM                             | In Situ Microcosm   |
| ISTD                            | In-situ thermal desorption  |
| Jacobs                          | Jacobs Engineering Group  |
| LHAAP                           | Longhorn Army Ammunition Plant  |
| LTM                             | long-term monitoring  |



|                                     |   |
|-------------------------------------|---|
| LUC                                 | land use control  |
| MC                                  | methylene chloride  |
| MCL                                 | maximum contaminant level   |
| mg/kg                               | milligrams per kilogram   |
| mg/L                                | milligrams per liter  |
| mg/kg-day                           | milligrams per kilogram per day   |
| MNA                                 | monitored natural attenuation   |
| MOA                                 | memorandum of agreement   |
| MSC                                 | medium-specific concentration   |
| NA                                  | natural attenuation   |
| NCP                                 | National Oil and Hazardous Substances Pollution Contingency Plan                              |
| NOAEL                               | no-observed adverse effect level  |
| NPL                                 | National Priorities List  |
| O&M                                 | operation and maintenance   |
| ORC                                 | oxygen release compound   |
| OSHA                                | Occupational Safety and Health Administration   |
| PCE                                 | tetrachloroethene   |
| PCL                                 | Protective concentration level  |
| PP                                  | Proposed Plan   |
| PPE                                 | Personal protective equipment   |
| PSI                                 | Post-Screening Investigation  |
| RAB                                 | Restoration Advisory Board  |
| RAO                                 | remedial action objective   |
| RCRA                                | Resource Conservation and Recovery Act  |
| RD                                  | remedial design   |
| 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.  |
| SIP                                 | stable isotope probing  |
| STEP                                | Solutions to Environmental Problems, Inc.   |
| SVE                                 | soil vapor extraction   |
| SVOC                                | semivolatile organic compound   |
| TAC                                 | Texas Administrative Code   |
| TCA                                 | trichloroethane   |
| TCDD                                | tetrachlorodibenzo-p-dioxin   |
| TCE                                 | trichloroethylene   |
| TCEQ                                | Texas Commission on Environmental Quality   |
| TCH                                 | Thermal conduction heating  |
| TEC                                 | toxicity equivalence concentration  |
| TNB                                 | trinitrobenzene   |
| TNT                                 | trinitrotoluene   |
| TOC                                 | total organic carbon  |
| TRRP                                | Texas Risk Reduction Program  |
| TRRP Residential<br>Groundwater PCL | Texas Risk Reduction Program Tier 1 Residential Groundwater Protective<br>Concentration Level |
| TRV                                 | toxicity reference level  |
| UCL                                 | upper confidence limit  |
| UEP                                 | Unlined Evaporation Pond  |
| U.S.                                | United States   |
| 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                 |
| UTL             | Upper tolerance limit                          |
| UU/UE           | unlimited use/unrestricted exposure            |
| VC              | vinyl chloride                                 |
| VOC             | volatile organic compound                      |
| yd <sup>3</sup> | cubic yards                                    |
| ZVI             | zero-valent iron                               |



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# 1. The Declaration

## 1.1 Site Name and Location

Longhorn Army Ammunition Plant (LHAAP) -18/24, Burning Ground No. 3 and Unlined Evaporation Pond (UEP)

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 Record of Decision (ROD) presents the selected remedy for LHAAP-18/24, Burning Ground No. 3 and UEP, located at LHAAP in Karnack, Texas. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. §§9601, et seq.), 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 (C.F.R.) Title 40 §§ 300 et seq.

The remedy selection was based on documentation available in 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], 2007), baseline ecological risk assessment addendum (BERA) report (AGEISS, 2014), feasibility study (FS) (AECOM, 2017), post-screening investigation (PSI) (AECOM, 2013), updated PSI (AECOM, 2016a), and supplemental to updated PSI (AECOM, 2016b) and proposed plan (PP) (U.S. Department of the Army [U.S. Army], 2019).

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 Texas Commission on Environmental Quality [TCEQ]) entered into the Federal Facility Agreement (FFA) for remedial activities at LHAAP which became effective on December 30, 1991. The USEPA (Region 6) and the 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 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-18/24 includes enhanced groundwater extraction and treatment, Land Use Controls (LUCs), enhanced in-situ bioremediation (EISB) for Shallow Zone and



Wilcox formation groundwater inside and outside the containment area, thermal dense non-aqueous phase liquid (DNAPL) removal, maintenance of the existing cap over the UEP, unsaturated soil excavation and off-site disposal, Monitored Natural Attenuation (MNA) and long term monitoring.

The final selected remedy for LHAAP-18/24 protects human health and the environment by preventing human and ecological receptors from being exposed to contaminated soil and contaminated groundwater. The human health risk assessment scenarios evaluated were based on the hypothetical future maintenance worker. In the soil, chemicals of concern (COCs) are volatile organic compounds (VOCs) (trichloroethylene [TCE], methylene chloride [MC], tetrachloroethene [PCE]) and the anion perchlorate. In the Shallow Zone groundwater, COCs include VOCs (MC, TCE, cis-1,2-dichloroethylene [DCE], PCE, benzene, 1,1,2-trichloroethane [TCA], vinyl chloride, bromodichloromethane, 1,3,5-trinitrobenzene [TNB], and 1,4-dioxane), metals (arsenic, barium, chromium, cobalt, and nickel), and the anion perchlorate. In the underlying Wilcox Formation groundwater, COCs include VOCs (MC, TCE, cis-1,2-DCE, PCE, benzene, vinyl chloride, bromodichloromethane, 1,3,5-TNB, and 1,4-dioxane), metals (arsenic and barium), and the anion perchlorate. Residual MC and TCE DNAPL acting as a source material at two locations in the Shallow Zone and Wilcox Formation groundwater may be considered a principal threat waste at LHAAP-18/24.

The components of the selected remedy are summarized below:

- Continued use of the existing groundwater extraction system, as needed, with enhancements (including a potentially phased reactivation of two existing Interceptor-collection trenches (ICTs) [ICT 3 and 9]) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Continued operation of the current groundwater treatment plant (GWTP), or potentially a new GWTP as needed, will be determined during the remedial design phase. Should treatment for 1,4-dioxane be required, an advanced oxidation process will be implemented as a contingency remedy. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Excavation of unsaturated soil exceeding TCEQ soil medium-specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind). Additional confirmation soil sampling during the remedial design (RD) will be needed to define the final excavation extent and volume of soil contaminated in the two areas south of the UEP and area west of the UEP.
  - If during the Five-Year Review the results of the groundwater remedy indicate that vadose zone soil under the UEP constitutes a continuing source that requires a response, a contingency remedy to excavate soil beneath the UEP would be developed. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Implementation of enhanced in-situ bioremediation (EISB) of Shallow Zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations or as needed.
- Implementation of in-situ thermal desorption (ISTD), using either Electrical Resistance Heating (ERH) or Thermal Conduction Heating (TCH), to remove DNAPL in two distinct areas inside the containment area.





- MNA for both Shallow Zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after evaluation of EISB) to reduce contaminant levels to confirm protection of human health and the environment by documenting that the contaminated groundwater remains localized with minimal migration and that COCs are being reduced to cleanup levels.
  - Performance objectives will be evaluated after two years of MNA. During those two years, monitoring will be quarterly. If MNA is found to be effective, it will be continued, and long-term monitoring (LTM) will be semiannual for three 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.
  - If MNA is found to be ineffective, a contingency remedy to enhance MNA would be developed. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Development and specific description of the contingency remedy would be presented in a Remedial Design/Remedial Action Work Plan (RD/RAWP).
- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year intervals.
- Maintenance of existing cap over the former UEP. The need to continue cap maintenance will be evaluated at five year intervals.
- Long-term monitoring and reporting would continue until the cleanup levels are achieved.
- The LUC's objectives include maintaining the integrity of any current or future remedial or monitoring systems, preserving the integrity of the surface impoundment cap over the UEP and to restrict intrusive activities (e.g., digging) that would degrade or alter the cap, 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 U.S. 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.<sup>1</sup>

<sup>1</sup> This paragraph is October 31, 2014 Dispute Decision language that is included despite the ROD not being subject to the dispute.



- 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 **Table 2-10**) in soil and groundwater remaining at the Site are reduced below levels that would support unlimited use and unrestricted exposure (UU/UE). A LUC RD will be finalized as the land use component of the RD. Within 21 days of the issuance of the ROD, the U.S. 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 USEPA and the 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. The recordation notification for the Site, which will be filed with Harrison County, will include a description of the LUCs.<sup>1</sup> The preliminary boundary for the groundwater LUC is shown on **Figure 2-18**.
- 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 **Table 2-10**) are at levels that allow for UU/UE.<sup>1</sup>
- 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 **Table 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 UU/UE.<sup>1</sup>
- The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g, digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

CERCLA five-year reviews will be conducted 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 2-10**) in soil and groundwater allow for UU/UE.

Under this remedial alternative, two ISTD technologies (ERH or TCH) will be considered during the Remedial Design phase to treat the high concentration of dissolved VOCs and DNAPL in the Shallow Zone and Wilcox Formation groundwater. While the technology is more expensive, it is very effective in low permeability zones where the majority of the residual DNAPL resides. A removal rate of 99.9% is expected. EISB would be applied to the thermally-treated areas as a polishing step after thermal treatment is completed. LUCs would be implemented to restrict land use to nonresidential uses until it is demonstrated that COCs in soil and groundwater are reduced to levels that would allow for UU/UE. Maintenance of the UEP cap will continue. It is estimated that this alternative allows achievement of the remedial action objectives (RAOs) within 20 years. Considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the times to



achieve cleanup levels may vary by an order of magnitude. In the course of the remedy, the additional monitoring results will allow more accurate time estimates.

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 RD will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the U.S. 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 USEPA 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.<sup>1</sup>

The U.S. Army will implement, maintain, monitor, report on and enforce LUCs at U.S. Army-owned property. The U.S. Army shall perform those actions related to land use control activities described in this ROD and in the RD for the ROD. For portions of the Site subject to LUCs that are not owned by the U.S. Army, the U.S. Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The U.S. Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The U.S. 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 LUCs. The U.S. Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the RD for the ROD. The U.S. Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The U.S. Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.<sup>1</sup>

Upon transfer of U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs to property, 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 U.S. Army shall provide the USEPA 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 U.S. 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 LUCs 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.<sup>1</sup>

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at this Site after it has been transferred.

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-18/24 is independent of any other remedial action at LHAAP to address human health issues. To address ecological risk, LHAAP-18/24 was grouped with several other sites as part of the Industrial Sub-Area. Ecological hazards were found to be acceptable for the Industrial Sub-Area that includes LHAAP-18/24 (Shaw, 2007a). This management strategy is considered to be endorsed by regulators as evidenced by the regulatory approval of the BERA (Shaw, 2007a) and BERA Addendum (AGEISS, 2014). Therefore, no action is required for environmental receptors.



## 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 for the remedial action, is cost-effective, and provides a permanent solution.

In addition, the remedy offers long-term effectiveness through excavation and disposal of contaminated soil; ISTD DNAPL removal; EISB of shallow and Wilcox Formation groundwater; continued use of the existing groundwater extraction system, as needed, with enhancements; contingency use of advanced oxidation process for ex-situ treatment of 1,4-dioxane in groundwater; and, the implementation of LUCs, which will minimize the potential risk to the hypothetical future maintenance worker posed by the contaminated soil and groundwater. Evaluation of MNA including routine monitoring of the attenuation until cleanup levels are met will document the effectiveness of the selected remedy. In the event that MNA is determined to be ineffective, a contingency remedy consisting of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations will be developed and implemented. Development and specific description of the contingency remedies will be presented in a RD/RAWP. The selected remedy is easily and immediately implementable and has a moderate cost compared to the other alternatives considered for LHAAP-18/24, with the exception of the no action alternative.

The selected remedy would reduce the toxicity, mobility, or volume of contaminants in the groundwater through active and passive remedial actions. This response will permanently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the Site. The thermal treatment and EISB components of the selected remedy satisfy the statutory preference for treatment as principal treatment elements 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.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed by excavation during the remedial action. The high concentrations of TCE and MC in the shallow zone and Wilcox Formation indicate in two locations that residual DNAPL may be acting as a principal threat waste in the groundwater. Therefore, the presence of source materials in groundwater is considered a complete transport pathway that will be addressed with ISTD during the remedial action.

Because hazardous substances, pollutants, or contaminants will remain at the site above levels that allow for UU/UE, a five-year review will be conducted to confirm 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 restricting land use to nonresidential 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 **Table 2-10**) are at levels that allow for UU/UE; that a prohibition of groundwater use (except for environmental monitoring and testing) as a potable source 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 2-10**) in soil and groundwater allow for UU/UE; and, that 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 **Table 2-10**) in groundwater 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 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**).
- Principal threat wastes that will 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-18/24 which documents the final selected remedy. The undersigned is the appropriate approval authority for this decision.

2 JANUARY 2020

(Date)

Thomas E. Lederle  
Division Chief  
Base Realignment and Closure Division  
Office of the Deputy Chief of Staff, G9 (Installations)  
U.S. Army

The United States Environmental Protection Agency approves the selected remedy as provided in the ROD for LHAAP-18/24.

2/25/20

(Date)

Wren Stenger  
Director  
Superfund Division  
U.S. Environmental Protection Agency  
Region 6



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## 2. Decision Summary

### 2.1 Site Name, Location, and Description

**LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond**  
**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, not including LHAAP-18/24, 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-18/24 is a 34.5-acre cleared area within a heavily wooded section of LHAAP (**Figure 2-2**). The area is vegetated primarily with grass and has asphalt-paved roads. It is situated on a natural topographic high slightly west of the crest of a small topographic divide between Harrison Bayou and Saunders Branch. Topography of the Site has been altered by operations over the past 35 years. The burning ground area is mostly level with more relief near the western corner and near the northern corner that contains the mounded surface of the former UEP. There are no surface water bodies or watercourses running through LHAAP-18/24. Surface drainage occurs in all directions, but flow is generally directed to the north and west by both natural and manmade ditches and drainage swales towards Harrison Bayou. Harrison Bayou drains into Caddo Lake which is located approximately 2.5-miles northeast of LHAAP-18/24 (Jacobs, 2001).





## 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 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 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-18/24 is comprised of the former Burning Ground No. 3 (LHAAP-18) and UEP (LHAAP-24). LHAAP-18 Burning Ground No. 3 operated between 1955 and 1998, while LHAAP-24 UEP was operational from 1963 to 1984. The area was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial (Jacobs, 2001). The UEP was used to collect water from the washout of rocket motor casings and process waste sumps. Sludge from the UEP was removed in 1986 and the impoundment was capped. The majority of impacts to the soil were remediated during the 1997 LHAAP-18/24 Interim Remedial Action (IRA) when approximately 32,000 yd<sup>3</sup> of soil was removed. A groundwater extraction system incorporating approximately 5,000 feet (ft) of ICTs and a GWTP was installed in 1997 to control the migration of contaminated groundwater and to protect surface water. The area within the ICTs is considered the containment area. Harrison Bayou is located adjacent to the Site and drains to Caddo Lake, a drinking water supply.

### 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. Pre-Phase I investigations were conducted at LHAAP-18/24 from 1980 to 1987. Data analyses from previous investigations have been summarized by the U.S. Army Corps of Engineers (USACE) -Tulsa District in the report *A Data Summary Report of Investigation Results from 1976 through 1992 for Burning Ground 3 and the Unlined Evaporation Pond* (USACE, 1993). Additionally, Phase I through Phase III investigations were performed after 1993. Pre-Phase I and Phase I - Phase III investigations are summarized below.

- **Pre-Phase I Investigations:**

- During the LHAAP-18/24 investigation in 1980, the United States Army Environmental Hygiene Agency (USA-EHA) installed monitoring wells and collected



groundwater samples for laboratory analysis of anions, explosive compounds, metals, phenols, and physical/chemical characteristics (USAEHA, 1980).

- In 1982, Environmental Protection Systems (EPS) investigated the Site for the United States Army Toxic and Hazardous Materials Agency (USATHAMA) (EPS, 1984). As part of this investigation, an additional nine groundwater monitoring wells were installed at Site 18/24. Twenty-two groundwater samples were collected, nine from the newly installed monitoring wells and 13 from existing monitoring wells.
  - As part of the Groundwater Quality Assessment (GWQA) investigations, Camp, Dresser & McKee (CDM) installed ten monitoring wells around LHAAP-18/24 (CDM, 1986). Groundwater samples from the ten newly installed monitoring wells and 18 existing monitoring wells were collected and analyzed for metals, total organic carbon (TOC), selected anions, VOCs and explosive compounds. CDM concluded that the UEP was a source of groundwater contamination, but not the primary source for all of the contaminants identified, including nitrate and organic contamination in the groundwater (along the western edge of the burning ground) and barium (south of the burning ground boundary).
  - In 1987, EPS performed a site investigation at LHAAP-18/24 for the Thiokol Corporation and published a report in May 1988 (EPS, 1988). Groundwater samples were collected from three existing monitoring wells and analyzed for explosive compounds.
- **Remedial Investigation – Phase I, II, and III**
    - Numerous investigations to determine the nature and extent of contamination in the soil, groundwater, surface water, and sediments at LHAAP-18/24 were conducted during Phase I, Phase II, and Phase III investigations in 1993, 1995, and 1998, respectively (Sverdrup Environmental, Inc., 1993, 1996a, 1996b, 1999). Activities included installation of monitoring wells and analysis of groundwater, surface water, soil, and sediment samples. Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), metals, explosive compounds, perchlorate, pesticides, PCBs, and/or dioxins/furans, depending on the focus of the investigation. The Phase I, Phase II, and Phase III investigations at LHAAP-18/24 are documented in the Group 2 Sites RI (Jacobs, 2001).
  - **Plant-wide perchlorate investigation:** The groundwater investigation was conducted from 2000 through 2002 (Solutions to Environmental Problems, Inc. [STEP], 2005) to delineate perchlorate contamination.
  - **Baseline Human Health Risk Assessment and Screening Ecological 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 at LHAAP-18/24 posed a non-carcinogenic hazard and the groundwater posed unacceptable carcinogenic risk and non-carcinogenic hazard to the hypothetical future maintenance worker. The Ecological Risk Assessment did not identify potential risk to ecological receptors at LHAAP-18/24.



- **Baseline Ecological Risk Assessment:** The BERA (Shaw, 2007a) identified chemicals of potential ecological concern (COPECs) for the Industrial Sub-Area. The evaluation was based on environmental investigations from 1993 to 2004.
- **Post-Screening Investigations:** Additional investigations were conducted in 2013, 2014, and 2016 in an attempt to improve the Conceptual Site Model (CSM) and assess for the presence of source areas (unsaturated soil and DNAPL in the saturated Shallow Zone). These investigations are documented in the *Final Post-Screening Investigation Report for LHAAP-18/24* (AECOM, 2013), the *Final Updated Post-Screening Investigation Report – LHAAP-18/24* (AECOM, 2016a) and the *Draft Final Supplemental to the Updated Post-Screening Investigation Report, LHAAP-18/24* (AECOM, 2016b).
- **Baseline Ecological Risk Assessment Addendum:** Conducted in 2014, the BERA Addendum did not change the conclusion of the 2007 BERA (AGEISS, 2014).
- **Natural Attenuation Evaluation:** A preliminary evaluation was conducted to determine the occurrence of NA of MC, TCE, and perchlorate in the Shallow Zone and Wilcox Formation groundwater at LHAAP-18/24. Evaluation was performed for the purpose of determining whether the process is a viable remedial technology to be applied at the Site (AECOM, 2017; Appendix A).
- **Revised Feasibility Study:** The Revised FS was based on all available results from previous investigations through 2016. The CSM was refined and RAOs were developed in the FS. The FS identified and evaluated six remedial alternatives (including the no action alternative) to address the soil contamination and groundwater contamination in the Shallow Zone and Wilcox Formation (AECOM, 2017).

**Figure 2-3** shows the locations for all of the investigations conducted at LHAAP-18/24.

### 2.2.3 Site 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 a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP-18/24 was one of the originally listed NPL sites in the FFA. The Revised FS for LHAAP-18/24 (AECOM, 2017) was issued in January 2017, and the Proposed Plan (U.S. Army, 2019) was issued in February 2019. This ROD follows that Proposed Plan (PP) 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-18/24 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, 2019) for the selection of the remedy for LHAAP-18/24 was released to the Administrative Record and made available to the public for review and comment



beginning April 2, 2019. The notice of availability of the PP and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on April, 2 2019. The newspaper and media notices for the meeting are provided in **Appendix A**. The public comment period for the PP began on April 2, 2019 and ended May 2, 2019. A public meeting was held on April 25, 2019 in a formal format and with a court reporter. The transcript for the meeting is part of the Administrative Record. The significant comments received from the public (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 and at <http://www.longhornaap.com/>:

Location: Marshall Public Library  
300 S. Alamo  
Marshall, Texas 75670

Business Hours: Monday, Tuesday, Thursday (9:30 AM – 7:30 PM)  
Wednesday and Friday (9:00 AM – 5:30 PM)  
Saturday (9:30 AM – 3:30 PM)

## 2.4 Scope and Role of Response Action

The response action will prevent potential risks associated with exposure to contaminated soil and groundwater in both the Shallow Zone and Wilcox Formation. Present as residual DNAPLs in groundwater near the UEP and the ACD, TCE and MC are highly toxic materials constituting principal threat wastes. Treatment of the residual DNAPLs will remove continuing sources of groundwater contamination. TCE and MC are also present in unsaturated soils in isolated locations south of the former UEP, west of the UEP, and underneath the UEP acting as a low-level threats to groundwater. The removal of source soils will positively impact groundwater by eliminating the potential for the leaching of contaminants from the soil into the groundwater and will remove the contamination that poses a risk to ecological receptors.

The selected action at LHAAP-18/24 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 RAOs for this response action, the U.S. Army has considered the NCP's expectation to return usable groundwater to its potential beneficial uses wherever practicable and in a timeframe that is reasonable given the particular circumstances of the site (40 C.F.R. § 300.430(a)(1)(iii)(F)). The U.S. Army 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 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].

The U.S. Army intends to return the contaminated Shallow Zone and Wilcox Formation groundwater zones at LHAAP-18/24 to their potential beneficial uses, which for the purposes of this ROD is considered to be attainment of the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) to the extent practicable, and consistent with 40 C.F.R. §300.430(e)(2)(i)(B)&(C). In the absence of federal drinking water standards, clean-up levels will be based on the Texas Risk



Reduction Program (TRRP) Tier 1 Residential Groundwater Protective Concentration Level (PCL). The TCEQ soil medium specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind) is used in accordance with 30 TAC 335.559(g)(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 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.

In addition, the selected action includes excavation that will mitigate the residual contamination in the unsaturated soil that is considered a low-level threat waste. The relevant active remedial components of the selected action include EISB inside and outside the containment area and in the Shallow and Wilcox Formation, ISTD DNAPL removal, and enhanced groundwater extraction and treatment as needed. By instituting these technologies, the selected action will comply with NCP expectations regarding treatment of affected media where principal threat waste may be considered.

## 2.5 Site Characteristics

This section of the ROD presents a brief comprehensive overview of the LHAAP-18/24 site characteristics with respect to the 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

LHAAP-18/24 is a 34.5-acre site that has been impacted primarily with VOCs and perchlorate. As illustrated on **Figure 2-4**, the CSM presents the human health pathways that are complete and being considered for remediation. Those pathways that are likely to be incomplete or have negligible impact are not being considered for remediation as discussed below. The BERA and BERA Addendum did not identify potential risk to ecological receptors at LHAAP-18/24 (Shaw, 2007, AGEISS, 2014).

The area was previously used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open detonation, incineration, evaporation, and burial. Historical waste management units include open burn pits, the UEP, stockpiles of solvent-soaked sawdust, and suspected waste burial pits. The UEP was constructed at the burning ground in 1963 as a holding pond to store explosive wastes resulting from the washout of rocket motor casings. In 1973, the pond also began receiving waste water containing solvent residues and solids. An air curtain destructor (ACD) was built in 1979 for the purpose of disposing of explosive and explosive-contaminated wastes by burning. A groundwater extraction system incorporating approximately 5,000 ft of ICTs and a GWTP was installed in 1997 to control the migration of contaminated groundwater as an IRA (AECOM, 2017).

Contamination from historical activities at LHAAP-18/24 have impacted two groundwater zones: the shallow zone extending from the surface to a depth of approximately 45 ft below ground surface (bgs), and the Wilcox Formation below the shallow zone. These two units are separated by a mostly





contiguous clay layer which is believed to be present across the entire Site with the exception of the area to the west and northwest towards Harrison Bayou.

VOCs and associated 1,4-dioxane, metals, and perchlorate releases associated with past operations of the former burn pits, burial trenches, the ACD, and the UEP were the contamination sources in soil at LHAAP-18/24. An IRA performed in 1997 removed approximately 32,000 yd<sup>3</sup> of contaminated source area soil that was treated using low temperature thermal desorption. The majority of the contaminated soil was remediated during the IRA; however, some residual contaminants remain in the unsaturated soil. Based on the results of the BHHRA (Jacobs, 2002), the soil at LHAAP-18/24 does not pose an unacceptable carcinogenic risk or non-cancer hazard; however, the concentrations of contaminants in soil could be an ongoing source of groundwater contamination.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. Therefore, the potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed during the remedial action.

Other than the unsaturated soil locations with residual contamination, the medium of concern at LHAAP-18/24 is the groundwater. The contaminants in the saturated zone occur as dissolved plumes within the containment area and outside the containment area where contaminants have migrated off-site before the installation of the ICTs and GWTP. Additionally, residual DNAPL is present in the UEP and former ACD areas.

Groundwater contamination in the form of VOCs, 1,4-dioxane, metals, and perchlorate in the shallow zone and the Wilcox Formation poses a potential risk to the hypothetical future maintenance worker at LHAAP-18/24. Concentrations of VOCs and perchlorate were detected in wells screened in the shallow zone and in localized areas in the Wilcox Formation, though shallow zone contamination is more widespread. Since the groundwater at LHAAP-18/24 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 zone groundwater migrate toward surface water and may discharge via seepage. Although this transport pathway is currently mostly mitigated by the operation of a groundwater extraction system, the seepage of groundwater to surface water represents a pathway that is addressed by the selected remedial action.

## 2.5.2 Geology and Hydrogeology

Surficial soils at LHAAP-18/24 consist of sandy silty clays and clays underlain by a sandy silt to silty sand stratum. This clay stratum pinches out to the east of the burning grounds and becomes ill defined at the contact between the Wilcox Group and the alluvium of Harrison Bayou to the west and north of the site (Jacobs, 2001).

The shallow alluvial zone at LHAAP-18/24 is very heterogeneous consisting of discrete sand channels encapsulated in lower permeability silt/clay floodplain sediments. The thickness of the shallow alluvium is variable, because of the irregular contact with underlying Wilcox. Thickness ranges from 10 to 40 ft. The zone is characterized by potentially complex flow paths, gradients depending on where sandy channel deposits intersect and/or diverge. In general, the axes of channel deposits trend toward the north and northeast (AECOM, 2015).



The permeable intervals (sands, silty sands) associated with individual channel fill or point bar sediment packages range in thickness from 10 to 20 ft thick generally. Sands are typically fine to medium grained. Many of the channel fill sand bodies include a percentage of silt. Levee or overbank sand bodies were identified where possible. Typically, the fine levee sands display an abrupt coarsening upward grain size trend, are 5 to 10 ft in thickness, and may have some evidence of root or soil formation in the form of noted “mottling” of the sediments (AECOM, 2015).

A clay unit separating the shallow alluvium from the Wilcox sands occurs at the top of the Wilcox Formation throughout most of the site. However, this clay is missing in the northwestern corner of the site. The clay is missing where fluvial incision has occurred during both the deposition of the shallow Wilcox (incision indicated by a well-defined gravel lag deposit at 18WW06 as well as later incision by the Harrison Bayou. The thickness and extent of the “Wilcox clay” layer varies in thickness from 0 to 20 ft and may be in contact with overlying floodplain silts and clays or incised by overlying channel sands. The sands of the Wilcox Formation are homogenous and vary in grain size from medium to fine silty sands (AECOM, 2015).

**Figures 2-5 and 2-6** show the well locations and groundwater elevations for the Shallow Zone and Wilcox Formation, respectively.

### 2.5.3 Sampling Strategy

Numerous sampling events were conducted at LHAAP-18/24 from 1980 to 2016, as described in **Section 2.2.2**. Early investigations included collection of soil, sediment, and surface water samples, and installation of groundwater monitoring wells and groundwater sampling 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 groundwater monitoring wells to further delineate the nature and extent of contamination. Samples from all media were analyzed for various analytes including perchlorate, metals, VOCs, SVOCs, and 1,4-dioxane. In 2014, a treatability study for an In Situ Microcosm (ISM) study using stable isotope probing (SIP) was performed at the Site to determine whether the addition of oxygen release compound (ORC) or emulsified vegetable oil (EVO) would enhance the biodegradation of MC. During 2016, a preliminary evaluation of the occurrence of NA of MC, TCE, and perchlorate present in the shallow zone and Wilcox Formation groundwater at LHAAP-18/24 was performed. This analysis is important in determining if NA should be considered as a remedial process applicable at the site.

### 2.5.4 Nature and Extent of Contamination

The collective investigative results at LHAAP-18/24 identified groundwater contamination present at concentrations that pose an unacceptable risk to human health or the environment that require remedial action. TCE, MC and perchlorate present the vast majority of the human health risk in groundwater. The concentrations of TCE and MC in some portions of the site are sufficiently high to indicate the possible presence of DNAPL within the saturated zone. 1,4-dioxane is present as isolated plumes while occurrences of other VOCs and metals concentrations in groundwater are intermittent and their distribution is generally not contiguous across the site.

Soil has not been identified as a medium of concern for protection of human health and ecological risk; however, it was identified as a medium of potential concern for the protection of groundwater from potential cross-media transfer. Unsaturated soil exceedances are shown on **Figure 2-7**.

Groundwater at LHAAP-18/24 has been identified as the medium of concern because of the risk it



poses to a hypothetical future maintenance worker. Contaminant plumes for the shallow zone and the Wilcox Formation contaminants are illustrated on **Figures 2-8 through 2-11** and **Figure 2-12 through 2-15**, respectively. Contamination at LHAAP-18/24, as described in the *Final Revised Feasibility Study* (AECOM, 2017), is as follows:

### Soil

- Unsaturated soil in two areas south of the former UEP contain TCE and MC as well as PCE at concentrations that exceed their respective GWP-Ind values and could leach to groundwater at concentrations exceeding the MCLs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway that will be addressed during the remedial action. A more refined extent determination of COCs in the soil in these areas is recommended, but will be defined as part of the RD. The estimated in-place volumes are 414 yd<sup>3</sup> and 602 yd<sup>3</sup>, respectively, with both areas having been previously excavated to a depth of 4 ft bgs.
- Unsaturated soil in the area west of the UEP within the former Burn Burial Area contains TCE and MC as well as some perchlorate that could leach to groundwater at concentrations exceeding the MCLs or PCLs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway that will be addressed during the remedial action. Due to the shallow nature of impacted soil, the full extent will be readily determined during the RD phase. The estimated in-place volume is 416 yd<sup>3</sup>. Further refinement of the extent will take place during the RD phase.
- Two soil areas beneath the UEP had concentrations of TCE and/or MC that exceed the groundwater protection-industrial MSCs. The leaching of contaminants from the unsaturated soil to groundwater is considered a complete transport pathway. The first area is in the vicinity of 18CPT21 and the second area is in the vicinity of 18CPT25. A conservative extent estimate is 280 ft by 110 ft and a thickness of approximately 10 ft. Thus the estimated in-place soil volume is 11,400 yd<sup>3</sup>. These two areas may be considered for remediation in the future as a contingency remedy. Further refinement of the extent would take place during the contingency RD phase, if needed, particularly since an overlapping area where DNAPL exists will be remediated.

### Groundwater

- A plume of dissolved perchlorate contamination that exceeds the cleanup level exists under the entire site in the Shallow Zone with additional significant plume areas outside the LHAAP-18/24 footprint. The extent of the contamination in the Shallow Zone is estimated at 67 acres. In the Wilcox Formation, two perchlorate plumes, one occupying the entire west and southwest half of the containment area and the other in the north corner of the containment area, are estimated at a combined 21 acres.
- A plume of dissolved MC contamination exceeding cleanup levels exists in the Shallow Zone and in the Wilcox Formation near the southern area of the UEP. To the west of the ACD, the Wilcox Formation plume has very low MC concentrations. The size of the MC plume in the Shallow Zone is approximately 7.3 acres, and 4.8 acres in the Wilcox Formation.
- A plume of dissolved TCE contamination exceeding the cleanup level exists in the Shallow Zone under the entire site with additional significant plume areas outside the LHAAP-18/24 footprint. The size of the TCE plume in the Shallow Zone is approximately 59 acres. The high





TCE concentrations in shallow groundwater coincide with the two areas of MC contamination: MW-2 south of the former UEP, and monitoring well 120 northwest of the former ACD. A Wilcox Formation dissolved TCE plume has an area of approximately 16.6 acres and covers a large portion of the containment area with the highest concentration found in MW-14 in the former ACD area.

- A plume of dissolved 1,4-dioxane exceeding the cleanup level exists in the Shallow Zone in the ACD area and another plume is present to the south, in the area around MW-7. The size of the 1,4-dioxane plumes in the Shallow Zone is approximately 2.7 acres. A Wilcox Formation dissolved 1,4-dioxane plume has an area of approximately 1.2 acres centered around MW-14 in the former ACD area.
- Isolated detections of metals in the Shallow Zone at concentrations exceeding the MCLs/PCLs occur across the site, but without the clear plume patterns exhibited by VOCs. The major metals in the Shallow Zone are arsenic, barium, and chromium. The other metals (cobalt and nickel) are not detected consistently. In the Wilcox Formation, sporadic detections of arsenic above the MCL/PCL were reported in three wells.
- The source of VOCs in residual DNAPL is estimated to be present in groundwater in the ACD area and southern area of the former UEP, respectively. The aerial extent of the UEP DNAPL extent is estimated at 35,500 square ft (ft<sup>2</sup>) and the aerial extent of the ACD DNAPL extent is estimated at 5,000 ft<sup>2</sup>. Although the DNAPL investigation in 2014 defined the extent of DNAPL in the vicinity of the ACD, given the high concentrations of TCE and MC in ICT-12-E (97,400 micrograms per liter [µg/L] and 173,000 µg/L in February 2013, respectively) and monitoring well 120 (24,500 µg/L in May 2013 for TCE), the ACD source area may be extended north from the ACD toward ICT-12E and monitoring well 120, increasing the area to be treated for DNAPL. Under this situation, the cost estimate for the DNAPL area in the vicinity of the ACD may become larger and will be considered during the RD phase.

Other than the limited unsaturated soil containing MC and TCE that could leach to groundwater at concentrations exceeding the MCLs, the mass of contaminants can be considered in three parts: 1) mass dissolved in groundwater, 2) mass adsorbed onto soil below the water table, and 3) mass in the form of DNAPL (TCE and MC) or soil contamination (perchlorate). The dissolved and adsorbed mass can be considered accessible mass, readily removed by groundwater extraction, although within the lower permeability zones, limitations of mass removal will reduce the removal rate of contaminants by groundwater extraction. The DNAPL can be considered source mass and is less readily removed.

## 2.6 Current and 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-18/24 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-18/24. Presently the Caddo Lake National Wildlife Refuge occupies a little more than 7100 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. When flowing, the streams flow into Caddo Lake, 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 aquifer (250 to 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 ft 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 (**Figure 2-2**). 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 0.3 miles northwest 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 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 ft 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-18/24 are approximately 2.16 miles, 2.25 miles, and 2.78 miles, respectively (Figure 2-2). The three water supply wells were completed at a depth much greater than the zone of contamination described at LHAAP-18/24. None of these three wells are currently used for drinking water at LHAAP, although they may supply water for non-potable uses. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned.

Although the anticipated future use of the facility as a wildlife refuge does not include the use of the groundwater at LHAAP-18/24 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 contaminants at 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), and the *Installation-wide Baseline Ecological Risk Assessment* (BERA) (Shaw, 2007) and the BERA Addendum (AGEISS, 2014). The risk assessment was completed using data from samples collected through February 2001 for groundwater and through 1998 for soil. Additional soil samples were collected during the perchlorate investigation in 2002, for the installation-wide BERA, and the sump investigation in 2006. A Preliminary Site Investigation was also conducted in 2013, 2014 and 2016 and additional samples were collected during that investigation. In general, the additional soil sample results do not change the conclusion of the risk assessments that soil poses no unacceptable human health risks to the hypothetical site worker. The discussion of results and risks presented here are therefore as presented in the Baseline HHRA and FS. 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  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  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 2-4**.

#### 2.7.1.1 Identification of Chemicals of Potential Concern

The BHHRA identified chemicals of potential concern (COPCs) for LHAAP-18/24 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-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalence concentration (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 ft bgs), dermal contact with the surface soil, inhalation of particulates, and inhalation of VOCs from the soil (0 to 7 ft bgs). 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 (mg/kg-day)<sup>-1</sup>

These risks are probabilities that usually are expressed in scientific notation. An excess lifetime carcinogenic risk of  $1 \times 10^{-6}$  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  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ .

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  $\text{HQ} < 1$  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  $\text{HI} < 1$  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:

$$\text{Non-carcinogenic HQ} = \text{CDI/RfD}$$

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 risks and non-carcinogenic hazard for groundwater are unacceptable; both the carcinogenic risk and the non-carcinogenic hazard for soil are acceptable. The carcinogenic risks for groundwater and soil are  $4.4 \times 10^{-1}$  and  $5.0 \times 10^{-7}$  and, respectively (Jacobs, 2002). The carcinogenic risk for ground water exceeds the USEPA target risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ; the carcinogenic risk for soil is less than the risk range. The HIs for groundwater and soil are 3,200 and 0.042, respectively. The groundwater HI is above the acceptable HI of < 1 while the soil HI is less than 1. Chemicals with a risk greater than  $1 \times 10^{-4}$  in groundwater include TCE, and methylene chloride. Chemicals with a HQ greater than 1 in groundwater include chloroform, perchlorate, methylene chloride, TCE, antimony, manganese, and nickel. Methylene chloride, TCE, and perchlorate were the primary contributors to the HI in groundwater; with HQs of 1,600, 800, and 750, respectively.

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. Additionally, the uncertainty analysis indicated a portion of the non-carcinogenic effects associated with manganese in groundwater may be due to background.

#### 2.7.1.5 Evaluation of COPCs

**Tables 2-6 through 2-9** list the chemicals in Shallow Zone and Wilcox Formation groundwater that exceed those values for the carcinogenic risk and HQ, respectively. There is no carcinogenic risk or non-cancer hazard in soil to the hypothetical maintenance worker. These tables also summarize 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, or when the EPC was above the MCL or in the absence of federal drinking water standards, the Texas Risk Reduction Program (TRRP) Tier 1 Residential Groundwater Protective Concentration Level (PCL). Recent data obtained after the BHHRA investigation was used when possible. Based on the comparison of the maximum groundwater concentration since the BHHRA to their associated SDWA MCL or PCL, these COCs have been identified on **Table 2-10** to be of concern in the Shallow Zone and Wilcox Formation groundwater.

Although exposure to soil does not pose an unacceptable carcinogenic risk or non-cancer hazard, the concentrations of contaminants in soil could be an ongoing source of groundwater contamination. To assess this, the potential soil-to-groundwater pathway was evaluated for TCE, MC, PCE and perchlorate. The concentrations of these chemicals were compared to their TCEQ soil MSCs for industrial use based on groundwater protection (GWP-Ind MSC), which are more stringent





than the soil MSCs for industrial use based on inhalation, ingestion, and dermal contact (TCEQ, 2006). The evaluation indicated that these contaminants could adversely impact groundwater, and the more stringent GWP-Ind MSC values are the proposed soil cleanup levels.

**Table 2-10** presents the final list of COCs and all media, along with cleanup levels.

The human health risk assessment, which was based on the reasonably anticipated future use as a national wildlife refuge, does not address unrestricted use. In accordance with 30 TAC 335.566, a notification will be recorded in the Harrison County records stating that the Site is suitable for nonresidential use.

## 2.7.2 Summary of Ecological Risk Assessment

The BERA (Shaw, 2007a) and BERA Addendum (AGEISS, 2014) 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
- Raccoon
- Modified Raccoon (as a surrogate for the Louisiana Black Bear)
- Short-Tailed Shrew
- Red Fox
- Muskrat
- River Otter
- Townsend's Big-Eared Bat
- Common Snapping Turtle
- Bank Swallow
- American Woodcock
- Belted Kingfisher
- Red-Tailed Hawk

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 ft) and total soil (0 to 3 ft). 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.

Ecological effects quotients (EEQs) 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-18/24 falls within the Waste Sub-Area. The Installation-Wide BERA did not identify potential risk to ecological receptors at LHAAP-18/24 (Shaw, 2007b). Should there have been any ecological risk, it would have been expressed by this point in time. The BERA Addendum completed in 2014 (AGEISS, Inc., 2014) did not change the conclusion of the 2007 BERA.

### 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. **Table 2-10** presents the COCs and the final cleanup levels for both soil and groundwater, with groundwater COCs for the shallow zone and the Wilcox Formation listed separately.

## 2.8 Remedial Action Objectives

The RAOs for LHAAP-18/24 presented in this ROD for the selected remedy and contingency remedies address contamination associated with the media at the Site and take into account the future uses of LHAAP surface waters, land, and groundwater. The RAOs for groundwater are:

- Protection of human health by preventing human exposure to the 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 to its beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the Site (40 C.F.R. § 300.430(a)((1)(iii)(F)).

RAOs for soil are:



- Protection of human health and the environment by preventing the migration of contaminants to groundwater from potential sources in the soil.

The above RAOs recognize USEPA's policy to return all groundwater to beneficial uses, based on 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.

Per these RAOs, and consistent with the NCP, groundwater will be returned to its beneficial use. In the absence of federal drinking water standards, the groundwater clean-up level at the Site is the TRRP Tier 1 Residential Groundwater PCL and is protective of human health and the environment.

## 2.9 Description of Alternatives

Six 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 NA would be ongoing.

*Estimated Capital Present Worth Cost: \$0*

*Estimated O&M Present Worth Cost: \$0*

*Cost Estimate Duration: NA*

*Estimated Present Worth Cost: \$0*

#### Alternative 2 – Enhanced Groundwater Extraction and Ex-Situ Treatment, LUCs, EISB Inside and Outside the Containment Area and in the Wilcox Formation, Unsaturated Soil Excavation, and Off-Site Disposal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within and outside the containment area.
- Replacement of the existing GWTP with a new GWTP with the contingency to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).





- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations.
- Implementation of groundwater extraction and removal of residual DNAPL in two distinct areas inside the containment area, as needed.
- Maintenance of existing cap over the UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- 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.
- MNA with 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.
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems 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 2-10**) in groundwater are met.

*Estimated Capital Present Worth Cost: \$10,600,000*

*Estimated O&M Present Worth Cost: \$19,600,000*

*Cost Estimate Duration: 30 years*

*Estimated Present Worth Cost: \$30,200,000*



Alternative 3 – Groundwater Extraction and Treatment, Containment (slurry wall), MNA outside the containment and in Wilcox Formation, and LUCs

The major components of this alternative include the following:

- Continued use of a reduced groundwater extraction system for hydraulic control, as needed.
- Replacement of the existing GWTP with a new GWTP with the contingency to treat for 1,4-dioxane.
- Installation of a slurry wall for containment of groundwater.
- Improvements to the soil cover to promote drainage and reduce infiltration.
- Maintenance of existing cap over the former UEP.
- MNA for groundwater contamination within the Wilcox Formation and outside the slurry wall.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- 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.
- MNA with 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
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems 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 2-10**) in groundwater are met.

*Estimated Capital Present Worth Cost: \$6,410,000*

*Estimated O&M Present Worth Cost: \$12,240,000*

*Cost Estimate Duration: 30 years*

*Estimated Present Worth Cost: \$18,650,000*



Alternative 4 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside & Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, and Surfactant Enhanced DNAPL Removal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Replacement of the existing GWTP with a new GWTP with the option to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of surfactant flushing for removal of DNAPL in two distinct areas inside the containment area at the site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- 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.
- 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
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that



may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems 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 2-10**) in groundwater are met.

*Estimated Capital Present Worth Cost: \$13,110,000*

*Estimated O&M Present Worth Cost: \$19,390,000*

*Cost Estimate Duration: 30 years*

*Estimated Total Present Worth Cost: \$32,500,000*

Alternative 5 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside and Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, Thermal DNAPL Removal

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Replacement of the existing GWTP with a new GWTP with the option to treat for 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of thermal desorption and removal of DNAPL in two distinct areas inside the containment area at the site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.
- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- 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.
- 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

- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems 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 2-10**) in groundwater are met.

*Estimated Capital Present Worth Cost: \$19,520,000*

*Estimated O&M Present Worth Cost: \$13,150,000*

*Cost Estimate Duration: 20 years*

*Estimated Total Present Worth Cost: \$32,670,000*

Alternative 6 - Enhanced Groundwater Extraction and Treatment, LUCs, EISB Inside and Outside Containment Area and in Wilcox Formation, Unsaturated Soil Excavation and Off-Site Disposal, Enhanced DNAPL Remediation using Zero-Valent Iron (ZVI)

The major components of this alternative include the following:

- Continued use of the existing groundwater extraction system with enhancements (reactivate two existing ICTs) until COC concentrations are low enough that MNA can address remaining contamination within the containment area or potentially a new GWTP including contingency use of advanced oxidation process for treatment of 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind).
- Excavation of soil beneath the UEP could be implemented in the future as a contingency remedy (e.g., depending on the results of the Five-Year Review of the groundwater remedy).
- Implementation of ISB of Shallow Zone groundwater outside the containment area at several locations, in the Wilcox Formation at three locations, and inside the containment at five locations.
- Implementation of ZVI (micron-scale) for in situ treatment of DNAPL in two distinct areas inside the containment area at the Site.
- Maintenance of existing cap over the former UEP.
- MNA for both shallow and intermediate zone groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas to reduce groundwater contamination to cleanup levels and confirm contamination remains localized and degrades over time.



- A contingency remedy to enhance MNA if MNA is found to be ineffective. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Details for the contingency remedy would be presented in a RD/RAWP.
- 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.
- 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
- The LUCs' performance objectives are to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) are at levels that allow for unlimited use and unrestricted exposure; to preserve the integrity of the surface impoundment cap, and to restrict intrusive activities that may degrade or alter the cap until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved; and to maintain the integrity of any current or future remedial or monitoring systems 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 2-10**) in groundwater are met.

*Estimated Capital Present Worth Cost: \$102,230,000*

*Estimated O&M Present Worth Cost: \$19,390,000*

*Cost Estimate Duration: 30 years*

*Estimated Total Present Worth Cost: \$121,620,000*

## 2.9.2 Common Elements and Distinguishing Features

### Common Elements of Alternatives 2 through 6

Common elements of Alternatives 2 through 6 are described below.

**Maintenance of the existing cap over the former UEP** – The cap would continue to be monitored, maintained, and repaired, as necessary, to ensure long-term effectiveness. This includes inspections of the cap to check for erosion, settlement, and deep-rooted vegetation, and implementation of necessary repairs. Routine maintenance and repair of the cap would include actions needed to ensure that the integrity of the cap is maintained (e.g., mowing, seeding, and settlement/erosion repair)

**Operation of the existing GWTP and associated groundwater extraction system** – The intensity and duration of continued use varies within the alternatives.

**MNA to reduce and control COC concentrations in areas outside the direct influence of the containment area** – MNA relies on natural biological, chemical, and physical processes to reduce





the mass and concentrations of groundwater COCs under favorable conditions. MNA was evaluated and is a viable option for those areas but not as a primary remedy as additional evidence is needed for MNA to be used as a primary remedy. MNA for 1,4-dioxane has not been established at this time.

MNA sampling would be performed as part of groundwater monitoring plans. MNA sampling would be performed quarterly for the first two years, semiannually for the next three years, then annually until the next Five-Year Review. After that, the sampling frequency may be changed to once every five years if the data suggest less frequent sampling is appropriate. The analytical program would consist of VOCs, metals, perchlorate, and 1,4-dioxane. The following parameters would also be included in the initial analytical program: sulfate, nitrate, nitrites, alkalinity, TOC, and field tests for dissolved oxygen, redox potential, and ferrous iron. These parameters would be dropped when NA is well documented. Additional parameters that will be conducted for two events only in select Wilcox Formation wells (e.g., 18CPTMW01SW and 18CPTMW06SW for TCE and MC wells) to establish biodegradation potential include: reductive TCE and vinyl chloride (VC) gene expression, dehalococcoides and dehalobacter concentration, and compound specific isotope analysis for TCE. Subsequent LTM would be limited to VOCs, metals, and perchlorate.

**Inspection and Long-Term Groundwater Monitoring** – Alternatives 2 through 6 include inspection and LTM 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

**LUCs** – LUCs would be implemented to support the RAOs. The LUC for groundwater would prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing. The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source would remain 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is demonstrated that the 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 **Table 2-10**) 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 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 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

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 ROD, the U.S. 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 USEPA 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 will also be presented in the RD. 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 surface impoundment cap at the Site, in accordance with 30 TAC 335.565.

The U.S. Army will implement, maintain, monitor, report on and enforce LUCs at U.S. Army-owned property. The U.S. Army shall perform those actions related to LUC activities described in this ROD and in the RD for the ROD. For portions of the Site subject to LUCs that are not owned by the U.S. Army, the U.S. Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The U.S. Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any LUCs referenced in the ROD. The U.S. 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 LUCs. The U.S. Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the RD for the ROD. The U.S. Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The U.S. Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs 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 U.S. Army shall provide USEPA 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 U.S. 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 LUCs 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-18/24), 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, 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 (surface impoundment cap) or monitoring system or exposure to the contaminated groundwater (e.g., 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 LUCs objective at the Site after it has been transferred.

#### Distinguishing Features of Alternatives 2, 4, 5, and 6

The distinguishing features of Alternative 2, 4, 5, and 6 compared to Alternative 3 are excavation and removal of contaminated soil, enhanced groundwater extraction, and EISB. The enhanced element of the groundwater extraction and treatment and EISB employed in Alternatives 2, 4, 5, and 6 are described below.

**Enhanced Groundwater Extraction** – Enhanced extraction involves the reactivation of ICTs. Review of flow rates and contaminant concentrations suggest that reactivating certain ICTs that





were turned off could be very productive in removing contaminant mass from the subsurface if the extraction flow rate is sustainable. Two ICTs (ICT 3 and ICT 9) in particular have a high potential for removing a large amount of COC mass from the groundwater at least based on historical results. Sampling of the various inactive ICTs to determine which ICTs would be most effective will be conducted before determining which two ICTs will be activated.

**EISB** – The components of this action include: EISB would consist of the application of organic substrate (e.g., emulsified vegetable oil (EVO) or other formulations) as a bacterial food source, and a bacterial inoculation mix (e.g., SDC-9 or KB-1 Plus®), in areas of the groundwater plume outside the containment area within areas of high perchlorate and high TCE in the northeast, southwest, and southeast. Inside the containment, EISB would be conducted upgradient of MW-21 and 109 in the northeast boundary, near monitoring wells 120 and MW-14, and in the area of MW-23 and location 18CPT03 where high perchlorate concentrations were detected. EISB will also be applied near 18CPTMW08SW and 18CPTMW22SW into the Wilcox Formation due to the presence of high concentrations of perchlorate in the Wilcox Formation in this area of the Site. It is anticipated that EISB in the treated DNAPL areas will be implemented in a grid fashion with 25 by 25 ft spacing.

**Excavation and Off-site Disposal of Contaminated Soil** - Unsaturated soil exceeding the cleanup levels for soil listed in **Table 2-10** in two areas south of the UEP and two areas to the west of the UEP would be excavated and disposed off-site. The actual implementation of the soil excavation for the location beneath the UEP would be deferred to year 6 of remedy implementation at the earliest. The excavation and disposal activities for the other areas would be completed as part of the RA.

#### Distinguishing Feature of Alternative 2

The component of this action includes: Vertical extraction wells that will be placed inside the residual DNAPL areas and connected to the extraction manifold to the GWTP. The purpose of these extraction wells is to enhance removal of DNAPL. Free DNAPL, if present, will be removed by the gradient created by the extraction wells if present within the zone of influence. Additionally, a large portion of trapped DNAPL will be removed by enhanced dissolution as fresh groundwater is forced through the zone of influence of the wells.

#### Distinguishing Feature of Alternative 3

The distinguishing features of Alternative 3 compared to Alternatives 2, 4, 5, and 6 is the inclusion of a slurry wall for containment.

**Slurry Wall Containment** – The components of this action include: Construction of a slurry wall. A slurry wall is a continuous low permeability subsurface trench formed by mixing clay minerals (typically bentonite) with in situ soil to contain contaminated groundwater. It is constructed very much like an ICT with the exception that the intent is to prevent groundwater movement rather than encourage it. The slurry wall can be installed around the entire area of a shallow plume to effectively contain contaminated groundwater from lateral migration.

#### Distinguishing Feature of Alternative 4

This alternative is similar to Alternative 2, 5, and 6 with a specific means to enhance the removal of DNAPL from the shallow zone groundwater in the two DNAPL areas of the site. The application of surfactant flushing will accelerate removal of residual DNAPL, reduce remaining COC mass, and reduce the lifecycle of the project.



**Surfactant Flushing** – The components of this action include: Once a required treatability test to identify and optimize the concentrations of the most compatible surfactant(s)/electrolyte(s) mixture, and application volume to the site groundwater and soil is completed, a pilot-scale test is needed to better understand how well surfactant addition would be distributed in the subsurface and result in solubilization of DNAPL from both coarse and fine-grained soils (i.e., to understand limitations of distributing surfactant due to soil heterogeneity). This is an important step because the majority of the residual DNAPL was identified to occur in fine-grained soils (low permeability zones). Pilot-scale testing will also be used to determine whether DNAPL migration to unintended areas would occur and to determine means to prevent this potential loss of process control. If pilot-scale testing proved successful, remediation will be designed and conducted. It is expected, however, removal of residual DNAPL via surfactant flushing and extraction will not be complete, particularly due to the difficulty in surfactant distribution within the low permeability zones. Removal of up to 90% is plausible based on vendor information, although this has to be confirmed by pilot-scale testing.

#### Distinguishing Feature of Alternative 5

This alternative is similar to Alternative 4 however, instead of surfactant flushing, Alternative 5 utilizes In Situ Thermal Treatment through ERH to accelerate removal of residual DNAPL. There are various ISTD technologies that could be applicable to the site conditions; however, ERH was selected for costing purposes and discussions, and costs presented in the FS and this ROD are based on this ERH technology.

**In Situ Thermal Treatment - ERH** – The components of this action include: The application of electrical current through the subsurface, resulting in the generation of heat. ERH uses the natural electrical resistance within the subsurface where energy is dissipated through ohmic, or resistive, losses. This manner of in situ heating allows energy to be focused into a specific source zone. When the subsurface temperature is increased to the boiling point of the pore water or the saturated media in the treatment zone, steam is generated. The steam strips contaminants from the soils and enables them to be extracted from the subsurface. In addition, contaminants are directly volatilized from unsaturated soil. ERH is particularly suited to the treatment of lower permeability strata and to DNAPLs that have become consolidated within zones of low permeability with higher organic content. An ERH system consists of subsurface electrodes connected to direct current through the subsurface, and a vapor extraction system to capture the volatilized water and contaminants. Removal of residual DNAPL via thermal treatment and extraction will remove at least 99.9%. Thermal treatment also enhances mobilization of organic matter from the soil to groundwater, which will act to enhance biodegradation of the COCs. Note that while the focus of this discussion is on ERH, other thermal treatment technologies such as thermal conduction heating could be equally applicable.

Application of thermal treatment in the southern area of the UEP will also remove COCs in the unsaturated zone (e.g., area represented by 18CPT21) that would otherwise be subject to excavation. Therefore, the volume requiring excavation is reduced and would be estimated by approximately 6,000 yd<sup>3</sup>.

#### Distinguishing Feature of Alternative 6

This alternative is similar to Alternative 5 however, instead of In Situ Thermal Treatment, Alternative 6 utilizes ZVI to accelerate removal of residual DNAPL.



**ZVI Treatment** – The components of this action include: Micron-scale ZVI will be injected into targeted zones using direct push tools and/or injection wells. The radius of influence of the injection point should be known to determine spacing of injection locations and allow overlap of radii of influence. For cost estimation, it is assumed that one injection point is conducted for every 100 ft<sup>2</sup> area (radius of influence of approximately 5.5 ft). The amount of ZVI should be such that excess quantities of iron is introduced to account for the mass of chlorinated VOCs but also for ‘natural demand’ to ascertain that sufficient residual remains in the formation to treat chlorinated VOCs associated with diffusion from fine-grained soils that would occur over time. A quantity of 0.01 lb/lb of micron-scale ZVI to formation soil is assumed based on treatability testing. Indication of distribution of ZVI can be determined using pH, ORP, and dissolved iron concentrations. Reapplication of ZVI might be required should conditions indicate absence of reducing conditions.

Injection of ZVI into DNAPL areas could have the unintended consequences of mobilizing DNAPL to unimpacted areas by virtue of creating a higher hydraulic head within the injection locations. This would be managed by minimizing the volume of fluid used to inject the ZVI, strategically placing the injection points starting at the perimeter of the area of impact and moving inward, and use of monitoring wells in the areas of injection particularly near the perimeter of the injection area to monitor CoC concentrations.

For cost estimating purposes, two applications of ZVI treatments are assumed with the second injection equal to 40% of the first injection due to mass and volume reduction associated with the first injection. Due to the difficulty in distributing the injected ZVI in low permeability zones, ZVI application is assumed to remove no more than 70% to 80% of the mass of VOCs per application.

### 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, 4, 5, and 6 provide the same outcome to mitigate exposure to human and ecological receptors by excavation and off-site disposal of the contaminated unsaturated soil to eliminate the potential soil-to-groundwater pathway, preventing further degradation of groundwater from contaminated soil. Alternatives 4, 5, and 6 also would significantly and permanently reduce groundwater contaminant concentrations to the applicable cleanup levels through active treatment using EISB and other technologies, and, therefore, provide long-term effectiveness and permanence within shorter timeframes than Alternatives 2 and 3. Alternative 3 would contain the contaminated groundwater and rely on MNA to reduce contaminant levels over time. Attainment of groundwater cleanup levels would require several hundred years for Alternatives 2 and 3. Groundwater cleanup levels should be in 20 to 30+ years for Alternatives 4, 5, and 6. However, considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the time to achieve the cleanup levels may vary by an order of magnitude. The similar outcomes are considered to be attainment of the SDWA MCLs to the extent practicable, and consistent with 40 C.F.R. §300.430(e)(2)(i)(B&C). If no SDWA MCL has been promulgated for a contaminant, the TRRP Tier 1 Residential Groundwater PCL is used in place of the SDWA MCL. 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 to the extent practicable, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source 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 2-10**) in groundwater are met; to restrict land use to nonresidential until it is



demonstrated that the 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 **Table 2-10**) 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 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 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

## 2.10 Summary of Comparative Analysis

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 2-11** 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 LUCs.

The six 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 and the environment because no measures would be implemented to eliminate potential exposure pathways for human exposure to the groundwater contamination or potential migration of COCs from groundwater to surface water.

All five action alternatives protect human health and the environment. The action alternatives implement LUCs to prevent exposure to contaminated groundwater, and continue operation of the groundwater extraction and treatment system until monitoring data verifies that the contaminant plume originating within the containment area is stable and contained. Alternative 3, which relies the most heavily on containment and LUCs, does not provide the same degree of contaminant removal or treatment in groundwater as the other alternatives, but would be protective of human health because the LUCs would prevent human access to the contaminated groundwater. Alternative 3 does not prevent migration of COCs from groundwater outside containment to surface water and it does not prevent migration of COCs from soil sources in the unsaturated and saturated soil to groundwater. Alternatives 2, 4, 5, and 6 provide a similar level of overall protection and can eventually achieve the cleanup levels for the groundwater COCs due to active remediation and continued operation of the groundwater treatment system for contaminant removal; however, the duration to achieve the cleanup levels vary. Furthermore, the LUC for groundwater would protect human health by preventing access to the contaminated groundwater 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 2-10**) in soils and groundwater allow for unlimited use and unrestricted exposure.



## 2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 C.F.R. §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 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-18/24. These standards are equivalent to the MCLs. In the absence of a federal drinking water standard, the perchlorate clean-up level will be based on TRRP Tier 1 Groundwater Residential PCL.

Alternative 1 does not comply with chemical-specific ARARs for groundwater, unsaturated soils, or secondary source within the saturated soil because no remedial measures would be implemented.

Alternative 3 is not expected to return groundwater concentrations within the slurry wall to less than the cleanup levels, so it does not meet the return to beneficial use RAO within the slurry wall. Alternative 3 will require an ARAR waiver for the groundwater within the slurry wall.

Alternatives 2, 4, 5, and 6 comply with the chemical-specific ARARs for groundwater, unsaturated soil, and secondary groundwater source (residual DNAPL) because they prevent exposure to groundwater that exceeds ARARs and would eventually return groundwater and soil concentrations to less than cleanup levels and return the groundwater in the shallow zone and Wilcox Formation to the potential beneficial use as drinking water wherever practicable.

All of the action alternatives would comply with the action-specific ARARs and any non-ARAR considerations.

## 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 on-site following remediation, and the adequacy and reliability of controls.

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 to risks posed by contaminated groundwater or the potential for contaminated groundwater to migrate to Harrison Bayou.

Alternative 2 offers a moderate degree of long-term effectiveness through operation of an enhanced groundwater extraction and treatment system, combined with unsaturated soil removal, residual DNAPL source removal, and LUCs implementation, which would minimize the potential risk posed by the contaminated groundwater. Reduction of the residual DNAPL source with groundwater extraction is not highly effective and therefore, the magnitude of residual risk will remain unacceptable.





Alternative 3 offers a degree of long-term effectiveness through physical containment of contaminated groundwater using a slurry wall and gradient control by pumping, combined with MNA to monitor effectiveness and LUCs to prevent groundwater use. Alternative 3 is designed to contain contaminated groundwater in place in perpetuity and would require a waiver of the restoration RAO prior to implementation. This alternative is effective in containing the contaminants but not practical as operation of the GWTP will have to occur in perpetuity.

Alternative 4 offers a higher degree of long-term effectiveness compared to Alternatives 2 and 3 through surfactant flushing of residual DNAPL, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment system, and LUCs implementation. Alternative 4 is likely to achieve groundwater cleanup levels in a shorter period of time than Alternative 2. However, the period of time remains long because the effectiveness of surfactant flushing of residual DNAPL in low permeability zones is uncertain due to the difficulty in reaching into the low permeability zones.

Alternative 5 offers the highest degree of long-term effectiveness through thermal remediation of VOCs in residual DNAPL saturated soil areas in groundwater, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment system, and LUCs implementation. Alternative 5 will achieve groundwater cleanup levels in a shorter period of time than Alternatives 3 or 4 because 99.9% removal of VOCs from the residual DNAPL areas is possible.

Alternative 6 also offers a high degree of long-term effectiveness through application of ZVI to the residual DNAPL saturated soil areas, ISB of groundwater inside and outside the containment and in the Wilcox Formation including as a polishing step for the residual DNAPL areas in the shallow zone, unsaturated soil excavation, enhanced groundwater extraction and treatment, and LUCs implementation. Alternative 6 relies on effective distribution of injected ZVI to all impacted areas. However, the ability to distribute injected ZVI into low permeability zones with high residual DNAPL may not be effective, and achieving results comparable to the treatability study results of greater than 99% reduction of TCE and high percentage reduction of MC and perchlorate is unlikely.

Alternative 5 is expected to have the shortest duration to shutdown of the GWTP. Alternatives 4 and 6, while rapidly addressing COCs in residual DNAPL areas, suffer from the difficulty of distributing the injected material to low permeability zones and may not be as effective as would be expected from a treatability test results where contact between the contaminants and the material is not limiting. Alternative 2 will not achieve the RAOs within an acceptable period of time (e.g., within 30 years). Alternative 3 would not reach cleanup levels within the slurry wall, and, due to the risk of containment failure, would be the least permanent remedy.

#### 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 does not employ treatment in groundwater and would not result in a reduction of toxicity, mobility, or volume of contaminants. All of the action alternatives provide some degree of reduction of toxicity, mobility or volume through treatment.



Alternative 2 provides a reduction in toxicity, mobility and volume via continued operation of an enhanced groundwater extraction and treatment system but the rate of reduction expected within the residual DNAPL areas will be slow.

Alternative 3 provides mobility reduction through the installation of a slurry wall and continued hydraulic control as needed. Reduction of volume through treatment is limited to NA mechanisms of contaminants outside the slurry wall and ex situ treatment of extracted groundwater from within the containment area.

Alternative 4 provides faster permanent reduction in toxicity and volume of the groundwater contaminants than Alternatives 2, and 3. This is achieved through surfactant flushing of saturated source soil to remove DNAPL that may serve as a long-term source of groundwater contamination, excavation of unsaturated soil, and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation. In addition to enhanced groundwater extraction, all the above technologies will result in a reduction in contaminant toxicity, mobility, and volume. However, reduction of mass of residual DNAPL via surfactant flushing is expected to be partial due to difficulty of surfactants to reach low permeability zones. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Alternative 5 provides the greatest reduction in toxicity, mobility, and volume of the groundwater contaminants compared to the other alternatives. This is achieved through thermal treatment of saturated source soil to treat DNAPL that may serve as a long-term source of groundwater contamination, excavation of unsaturated soil, and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation. In addition to enhanced groundwater extraction, this technology will result in a reduction in contaminant toxicity, mobility, and volume. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Alternative 6 provides a high level of reduction in toxicity, mobility, and volume of the groundwater contaminants compared to the other alternatives but is expected to be less than that achieved by Alternative 5. Reduction of mass of residual DNAPL via ZVI injection is expected to be partial due to difficulty of ZVI to effectively reach low permeability zones. Excavation of unsaturated soil and implementation of ISB in areas inside and outside the containment and within the Wilcox Formation, in addition to enhanced groundwater extraction will result in a reduction in contaminant toxicity, mobility, and volume. NA mechanisms of contamination outside the containment area will continue to act to reduce contaminant mass.

Biological activity would generate daughter products that may temporarily increase toxicity or mobility of the contaminant plumes. Alternatives 3, 4, 5, and 6 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.

### 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.



Because Alternative 1 does not involve remedial measures, no short-term risk to workers, the community, or the environment would exist.

All of the action alternatives involve potential short-term risks to workers associated with exposure to contaminated groundwater, vapor (i.e., volatilized and extracted VOCs), from monitoring and/or operation of drilling/construction equipment.

Alternative 2 presents risks associated with drilling new extraction wells, trenching for placement of conduits, and potential exposure to contaminated groundwater or heavy equipment. Alternative 2 presents potential risks associated with soil excavation (particulate emissions, heavy equipment) and off-site disposal which represents a greater exposure potential to LHAAP-18/24 workers, a greater potential for runoff releases to the environment and the potential for off-site traffic accidents and impacts on communities between LHAAP and the disposal facility. Risks are also associated with handling of chemicals used for ISB, although these chemicals are typically food grade and not harmful. Use of application equipment can also present risk.

Alternative 3 involves risks associated with the heavier equipment used in slurry wall construction and with handling the bentonite slurry used in construction. Alternative 4 requires a large construction footprint and will result in disturbing a wide area along the path of construction which will have an impact on the environment. Control of run-on and run-off would be critical to prevent cross-contamination of surface water. Risks associated with subsurface utilities are another concern of slurry wall installation.

Alternative 4 involves the same risks as Alternative 2 with the additional risks associated with surfactant flushing implementation which includes potential exposure to the surfactant and extracted fluids from the subsurface which would require surface handling, storage, treatment, and disposal.

Alternative 5 presents similar risks like Alternative 2 but has additional risks associated with implementation of thermal treatment technology which requires use of high voltage equipment and results in volatilization of VOCs that requires treatment at the ground surface.

Alternative 6 presents risks similar to Alternative 2 but with additional risk associated with use and handling of ZVI.

Alternatives 2 through 5 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 through a relatively quick implementation period.

By planning the construction, excavation, and transportation activities in accordance with industry and occupational safety and health administration (OSHA) codes and requirements, risks from contaminant exposure and construction operations would be controlled to acceptable levels. Dust control and sediment deposition into adjacent surface water bodies can be controlled during earthwork and construction activities. Erosion control measures would include surface grading; emplacement of silt fences; covering surfaces with straw, mulch, riprap, and/or geotextile fabrics. Following completion of all construction and excavation, disturbed areas would be regraded with clean backfill and revegetated with native grasses. Appropriate personal protective equipment (PPE) would be required for remediation workers. Overall risk can be mitigated by developing a health and safety plan in compliance with OSHA requirements, communicating the hazards to involved parties, and providing the know-how and tools to mitigate those hazards.





## 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.

Alternative 1, No Action, would involve shutting down the groundwater extraction system, which is assumed to be administratively unacceptable to the U.S. Army and to the regulatory agencies.

The action alternatives for groundwater are all technically implementable with varying degrees of difficulty.

Reactivation of existing ICTs for Alternatives 2, 4, 5, and 6 should be easy to implement as the tools and skilled resources are available. Similarly, implementation of additional extraction points for Alternative 2 should not pose any difficulties to drill the wells and connect the wells to the GWTP. ISB is specified for Alternatives 2, 4, 5, and 6. ISB has been implemented at other LHAAP sites and should not pose any difficulties to implement at LHAAP-18/24. Success of ISB was determined by conducting treatability testing and bioaugmentation at the laboratory scale. Treatability testing at the bench-scale and pilot-scale will also be required for surfactant remediation to select and optimize surfactant dose and provide proof of concept for Alternative 4 (i.e., loss of control for DNAPL migration, generation of adverse chemicals, and penetration effectiveness in low permeability zones). Thermal treatment (Alternative 5) does not require treatability testing and its implementability hinges on the availability of power to supply the electrodes with sufficient power to heat the saturated soils. Considering that power reliability has been a concern at the GWTP, this would be an important design consideration for this technology. Implementation of ZVI for Alternative 6 faces similar implementability considerations such as ISB implementation.

Alternative 3 has two significant implementation issues:

- The slurry wall would need to key into the confining layer for the shallow zone.
- Any significant discontinuities in the confining layer would need to be addressed.

There are areas at LHAAP-18/24 where both issues exist. Technologies are available to address both issues, but it will be difficult to ensure the quality of containment throughout the system.

For Alternative 2, 4, 5, and 6 soil excavation would also require coordination between excavation, sampling, transportation and disposal. However, because the volumes are not large, resources are readily available to implement.

## 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 costs include both capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Overall 30-year present value costs are developed for each alternative



assuming a discount rate of 3.0 percent. Total present value costs for each alternative are presented in Appendix D of the FS and a summary is presented below. It should be noted that some alternatives have extensive capital costs but could result in a serious reduction in the alternative lifecycle to achieve the RAOs (e.g., less than 30 years). Other alternatives that do not rely on intensive upfront remediation technologies have a very long remediation lifecycle (i.e., well beyond 30 years) that would outweigh the alternatives with high capital cost. Because cost determination was limited to 30 years per CERCLA requirements, the alternatives with high capital costs (e.g., Alternatives 5 and 6) appear to be as or more expensive on a 30-year basis than alternatives with low capital costs but long lifecycle duration (e.g., Alternatives 2 and 3).

The progression of total present value costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 3, Alternative 2, Alternative 4, Alternative 5, and Alternative 6. There are no costs associated with Alternative 1 because no remedial activities would be conducted. Alternative 6 has highest capital costs due to the high cost of ZVI, but lower O&M costs than all other alternatives with the exception of Alternatives 3 and 5. Alternative 5 has an O&M cost over 20 years after which the GWTP and extraction would be shut down. Alternative 5 has a higher capital cost associated with thermal treatment compared to Alternatives 2, 3, and 4. Alternatives 2, 3, and 4 have the lowest capital costs of the active remedial alternatives, with Alternative 3 having the lowest capital cost associated with slurry wall construction and lowest O&M cost due to the greater cost reductions in O&M associated with reduction in GWTP operation and reduction in monitoring costs (this alternative does not require full extraction of groundwater). Alternatives 2, 4, and 6 have the highest O&M costs of all the alternatives because it is assumed that GWTP operations will continue for 30 years with no reduction in extraction rates.

### 2.10.8 State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the PP, which presented Alternative 5 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. Comments were received during the 30-day public comment period held for the PP from April 2, 2019 to May 2, 2019, and verbal comments were received during the public meeting held on April 25, 2019.

Comment responses were provided and are summarized in the Responsiveness Summary (**Section 3.0**).

## 2.11 Principal Threat Waste

Laboratory results from the groundwater at LHAAP-18/24 have indicated that possible “pools” of DNAPL may be residing as residual source material in fractures and pores in the subsurface. As a component of this groundwater, the hazardous contaminants, TCE and MC, are characterized as a highly toxic source material and, thus, a principal threat waste. In accordance with the NCP, treatment alternatives have been evaluated through the remedy selection process. The preferred remedial alternative includes an active remedial component that would mitigate the potential principal threat. By instituting an ISTD treatment of the groundwater, this active treatment would be



applied to the two identified areas of DNAPL in the groundwater and would comply with the NCP expectations regarding treatment of affected media where principal threat may be considered.

## 2.12 The Selected Remedy

### 2.12.1 Summary of Rationale for the Selected Remedy

Alternative 5 – Enhanced groundwater extraction and treatment as needed, LUCs, EISB inside and outside containment area and in Wilcox Formation, unsaturated soil excavation, and thermal DNAPL removal is the preferred alternative for LHAAP-18/24 and is consistent with the intended future use of the site as a national wildlife refuge. The ISTD will rapidly reduce TCE and MC concentrations at two locations within the containment area to make conditions more amenable for EISB and/or MNA. The selected alternative offers a high degree of long-term effectiveness and can be easily and immediately implemented. This alternative is expected to achieve site RAOs in the shortest period of time compared to the other alternatives.

This alternative would satisfy the RAOs for the Site through the following:

- Continued use of the existing groundwater extraction system as needed with enhancements (including a potentially phased reactivation of two existing ICTs (ICT 3 and 9) until COC concentrations are low enough that MNA can address remaining contamination within the containment area.
- Continued operation of the current or potentially a new GWTP, including contingency use of advanced oxidation process for treatment of 1,4-dioxane.
- Excavation of unsaturated soil exceeding groundwater protection-industrial MSC (GWP-Ind) will result in the removal of soil that is a potential source of TCE and MC contamination to groundwater. The locations south of the former UEP, west of the UEP, and underneath the UEP have concentrations of residual contamination that pose a low-level threat to groundwater. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway. With the removal of this soil, the potential migration of TCE and MC from soil to groundwater would be eliminated and long-term operations/management for impacted soil would not be required.
- Implementation of EISB of shallow zone groundwater outside the containment area at several locations; in the Wilcox Formation at three or more locations, and inside the containment at five or more locations or as needed to reduce to levels amenable to MNA.
- Implementation of ISTD to remove DNAPL that poses a principal threat to groundwater in two distinct areas inside the containment area at the site to reduce to levels amenable to MNA.
- MNA for both shallow zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after evaluation of EISB) to reduce contaminant levels to cleanup levels and confirm the contaminated groundwater remains localized with minimal migration.
- Maintenance of the existing cap over the former UEP to reduce infiltration.
- The LUC to prohibit groundwater use (except for environmental testing and monitoring) as a potable source will be implemented to ensure protection of human health by preventing



exposure to groundwater 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 2-10**) in groundwater are met. The LUC restricting land use to nonresidential will be implemented until it is demonstrated that the 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 **Table 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 be implemented 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 2-10**) in groundwater are met. The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

- Long-term monitoring and reporting would continue until the cleanup levels are achieved in groundwater to confirm protection of human health by preventing exposure to groundwater until cleanup levels are met.

Five-Year Reviews will be performed to document that the remedy remains protective of human health and the environment. If necessary, after the five year review, the Army, EPA, and TCEQ will assess the successfulness of the groundwater remedy. At that time, the FFA parties will determine if the activation of a contingency remedy is appropriate.

Based on information currently available, 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: 1) is protective of human health and the environment; 2) complies with ARARs; 3) is cost-effective; 4) utilizes a permanent solution; and 5) utilizes an active treatment as a principal element. The selected remedy addresses the statutory preference for treatment to the maximum extent possible. The high concentrations of TCE and MC in the shallow zone and Wilcox Formation indicate that residual DNAPL material may be acting as a principal threat waste. Therefore, the presence of residual DNAPLs in groundwater near the UEP and the ACD are considered sources of groundwater contamination that will be addressed during the remedial action. In accordance with the NCP, treatment alternatives have been evaluated through the remedy selection process. The preferred remedial alternative includes an active remedial component that would mitigate the potential principal threat. By instituting ISTD treatment of the groundwater, this active treatment would be applied to the highest concentration area in the TCE and MC groundwater plume and would comply with NCP expectations regarding treatment of affected media where principal threat may be considered.

Unsaturated soil known to contain residual contamination posing a low-level threat to groundwater is isolated to locations south of the former UEP, west of the UEP, and underneath the UEP. The potential leaching of contaminants from the unsaturated soil at these locations to groundwater is considered a complete transport pathway that will be addressed during the remedial phase.



In the RD, the U.S. Army will present details of the soil excavation, selected ISTD process (ERH or TCH), ISTD design, LUC O&M, groundwater monitoring, EISB implementation, GWTP operation and modifications, and MNA remedy implementation for LHAAP-18/24.

## 2.12.2 Description of the Selected Remedy

The selected remedy, Alternative 5, was outlined in **Section 2.9**; that description is expanded in the following discussion. The assumptions and specifications presented for the remedy were used for cost estimating purposes and are subject to change in the remedial design process. The major components of the remedy include:

### **Continued use of the existing groundwater extraction system with enhancements, as needed.**

The use of the existing groundwater extraction system will continue where extraction will not interfere with in situ remedies and where needed to control the plume during in situ treatment. The extraction plan detailing which ICTs will be operational during each phase of remedy implementation will be further developed during the remedial design phase. The groundwater extraction system would continue to operate with additional ICTs inside the containment area brought back on line (i.e., modifications implemented as part of the pilot study implemented in 2008 (Shaw) will be partially reversed), or potentially a new GWTP replacing the existing GWTP would be designed and used to treat extracted groundwater.

Preliminary results from the pilot study indicate that certain ICTs that were turned off could be very productive in removing contaminant mass from the subsurface if the extraction flow rate is sustainable. Based on historical results, two ICTs (ICT 3 and ICT 9) in particular have a high potential for removing a large amount of COC mass from the groundwater. Sampling of the various inactive ICTs to determine which ICTs would be most effective will be conducted before determining which two ICTs will be activated. The criteria for evaluating the ICT sample results and basis for recommending ICTs to be reactivated will be developed and presented in the RD. Groundwater extraction acts to remove source mass and contain the contamination within the shallow zone only.

**Figure 2-16** shows the location of the ICTs, extraction wells, and pipelines that convey the extracted groundwater to the GWTP.

**Continued operation of the current or potentially a new GWTP, including contingency use of advanced oxidation process for treatment of 1,4-dioxane.** The existing groundwater extraction system currently removes water from 21 interception trenches and two vertical extraction wells (EW-1 and 18WW17). This groundwater extraction hydraulically controls migration of contaminants. The extracted groundwater is pumped to the GWTP, stored in an equalization tank for batch treatment, sent through precipitation to remove metals, subjected to air stripping to remove VOCs, and treated in a biological reactor to remove perchlorate. The treated effluent is discharged to Harrison Bayou or the INF Pond or released to Burning Ground No. 3 via a sprinkler system. Five other interception trenches that were previously used to extract groundwater (ICT-1, ICT-3, ICT-5, ICT-10, and ICT-12A) were deactivated on February 18, 2008 as part of a pilot test to encourage subsurface flow across the most contaminated portions of LHAAP-18/24. On December 5, 2012, ICT-12A was restored and is currently extracting groundwater.

Based on the estimates for the timeframe that will be required to remove the mass of contaminants within the containment area, it is expected that the GWTP will be operated for a minimum of 20 years. The current GWTP is nearly 17 years old and is aging, requiring frequent maintenance with anticipated more maintenance requirements with recapitalization for major item replacement in the





near future. Additionally, the existing GWTP is oversized with a design capacity of up to 300 gallons per minute (gpm) while current operations recover an average flow of 20 gpm. Due to the age of the plant, frequent maintenance requirements, and idling conditions, Alternative 5 includes the potential for capitalization of a smaller foot print GWTP to replace the existing plant. The specific design and capacity of a new GWTP would be determined based on current and projected extraction rates and volumes.

The continued operation of the current GWTP or potentially a new GWTP will be determined through a cost/benefit analysis conducted during the remedial design phase. If the new GWTP is selected, the new GWTP will be designed for a 50 gpm flow rate, which should accommodate the anticipated increase in groundwater extraction rates (reactivation of two ICTs and additional extraction wells in the DNAPL areas in addition to any extraction from LHAAP-17 that could go on line for a duration of 18 months). The system will consist of the same processes of metals precipitation, VOC stripper, and fluidized bed reactor (FBR) for removal of perchlorate. Should treatment for 1,4-dioxane be required, an advanced oxidation process using the HiPOx™ technology consisting of hydrogen peroxide with ozone will be implemented as a contingency remedy. The determination about whether 1,4-dioxane treatment is required will be made as part of the remedial design.

**Soil Excavation.** Soil at two locations to the south of the former UEP (**Figure 2-16**) identified by TCE and MC exceedances between the depths of 8 and 12 ft bgs and depths of 5.5 and 12 ft bgs will be excavated. Additionally, soil in the former burn pit area to the west of the former UEP at depths ranging from 4 to 14 ft bgs will be excavated. The soil will be removed to meet the cleanup levels presented in **Table 2-10**. The shallow soil will be removed and stockpiled for use as backfill if clean. However, the backfill soil will be characterized before reuse. Excavation side walls and bottom will be sampled to confirm clean soil before backfilling with clean soil. Additional excavation will be conducted if contaminants are detected in the excavation walls or bottom. The contaminated soil will be stockpiled, sampled for characterization, and then hauled off-site for disposal at either a RCRA Subtitle C or Subtitle D landfill depending on soil characteristics. The in-place volume is estimated at 1,350 yd<sup>3</sup>.

**A contingency remedy to excavate soil beneath the UEP.** If during the Five-Year Review the results of the groundwater remedy indicate a continuing source from the UEP, a contingency remedy to excavate soil beneath the UEP would be developed if COCs are present at concentrations exceeding the GWP-Ind. Criteria to be used to determine whether the contingency remedy should be implemented, as well as development and specific description of the contingency remedy would be presented in a RD/RAWP.

**Implementation of EISB of shallow zone groundwater inside and outside the containment area and in the Wilcox Formation.** EISB is planned in locations shown on **Figure 2-17** and where needed as a polishing step in thermal treatment areas. Final selection of the areas that will receive EISB will be developed during the remedial design phase. The locations on **Figure 2-17** are presented for costing purposes. ISB would consist of the application of organic substrate (e.g., EVO or other formulations) as a bacterial food source, and a bacterial inoculation mix (e.g., SDC-9 or KB-1 Plus®), in areas of the groundwater plume outside the containment area within areas of high perchlorate and high TCE in the northeast, southwest, and southeast. Inside the containment, ISB would be conducted upgradient of MW-21 and 109 in the northeast boundary, near monitoring wells 120 and MW-14, and in the area of MW-23 and location 18CPT03 where high perchlorate concentrations were detected. Enhanced bioremediation will also be applied near 18CPTMW08SW and 18CPTMW22SW into the Wilcox Formation due to the presence of high concentrations of



perchlorate in the Wilcox Formation in this area of the Site. **Figure 2-17** shows the area targeted for ISB treatment based on existing information.

ISB would be applied using direct push technology (DPT) injections. Injection via deep boreholes that are surface cased may be required for the Wilcox Formation. Tracer tests will be conducted to determine whether the proposed injection locations are within or outside the capture zone of the extraction system with the goal to prevent injected substrate from being pulled into the extraction ICTs. Additionally, in order to minimize loss of ISB amendments, extraction wells would be temporarily shut down when ISB treatment amendment begins to appear in the wells. If ISB amendments reached extraction sumps this may result in biofouling problems that subsequently lead to groundwater extraction complications. Therefore, nearby ICTs and monitoring wells will be monitored for the occurrence of treatment amendments during implementation of enhanced ISB.

ISB will enhance biodegradation of perchlorate in situ that would ultimately reduce the concentration of perchlorate and VOCs to a level that would allow NA to take over and reduce concentrations to below the cleanup levels.

ISB amendments that result in creating geochemical changes (reducing conditions) favorable for anaerobic biodegradation could also have the potential to result in mobilization of arsenic to groundwater. Under anaerobic reducing conditions, immobilized ferric iron becomes reduced and mobile in the form of ferrous iron. Arsenic generally co-precipitates with ferric iron and as the iron is solubilized in the form of ferrous iron, arsenic tends to come off the soil matrix into solution. Therefore, monitoring for arsenic in groundwater will be an integral part of this process.

ISB will enhance biodegradation of MC, TCE, and perchlorate in situ and ultimately reduce the concentrations of those chemicals to a level that would allow NA to take over and reduce contaminant levels to below the cleanup levels. **Figure 2-17** shows the multiple areas targeted for ISB treatment based on existing information.

For cost estimating purposes, the ISB is assumed to be implemented using a biobarrier injection configuration. The spacing of injection points is assumed to be 20 ft. For the purposes of costing, five ISB biobarriers are assumed one in the northeast (900 ft), one in the southwest (600 ft), two 300-foot biobarriers in the northwest in the vicinity of 18CPTMW23 and 18CPTMW15 and AWD-4, 150 ft ISB in the vicinity of monitoring well 120, and one in the south (200 ft) for a total length of 2,450 ft and 122 DPT injection points. For the two grid areas, each grid is 200 ft by 200 ft in area and the injection points are 25 ft apart for a total of 81 injection points in each grid. In the Wilcox aquifer, the ISB is assumed to use a biobarrier injection in two rows each 100 ft long and 50 ft apart. Injection would occur upgradient of 18CPTMW08SW based on the potentiometric surface for the Wilcox Formation in this area of the Site. Another 200 ft ISB is assumed in the vicinity of 18CPTMW22SW and 150 ft ISB for MW-14. The ISB biobarrier and grid layout will be determined during the remedial design.

Two applications of ISB treatment are assumed for costing purposes. The first application will be DPT injection of a slow releasing organic substrate (EVO) during year 1 in the areas depicted on **Figure 2-17**. Bioaugmentation is anticipated to be conducted 3 months after establishment of sustainable anaerobic conditions. It is assumed the first injection will reduce perchlorate concentrations by 90% and TCE and MC concentrations by 75%. The second application will be DPT injections of EVO and bioaugmentation during year 3 in the same areas. It is assumed the second injection will reduce perchlorate by 90% and TCE and MC by an additional 75%. After the



first 2 injections, it is assumed that MNA will control any remaining dissolved COCs. However, evaluation of whether additional applications would be required will be made from performance data.

Depending on the cleanup level achieved with thermal treatment for VOCs, it is anticipated that enhanced ISB in the treated DNAPL areas be implemented in a grid fashion with 25 by 25 ft spacing. Two events as described for other enhanced ISB will be implemented. Additionally, enhanced ISB would be required in the treated DNAPL areas due to the presence of perchlorate which is not readily removed by thermal treatment. Enhanced ISB application will occur when the temperature of the thermally treated area cools to below 30 °C.

**In-situ Thermal Desorption for DNAPL.** Under Alternative 5 the two identified areas of DNAPL groundwater will be treated using ISTD. These areas include the former UEP area extending approximately 35,500 ft<sup>2</sup> (ERH or Conductive Heating Area 1 on **Figure 2-16**) and the former ACD area extending approximately 5,000 ft<sup>2</sup> (ERH or Conductive Heating Area 2 on **Figure 2-16**) with a depth of impact to approximately 50 ft in the former UEP area and to 30 ft in the former ACD area. Groundwater extraction may be implemented as part of the in-situ treatment to physically remove mass and to control the hydraulic gradient.

ERH delivers electricity through subsurface media via an array of electrodes. The heat generated by electrical resistance typically can raise subsurface temperatures to around the boiling point of water. The steam produced from pore-water serves as a medium to carry out volatilized VOCs for capture via soil vapor extraction (SVE) and subsequent ex-situ treatment of extracted vapors. In addition, the applied heat can increase hydrolysis of chlorinated solvents, such as MC and promote in-situ biological activity in two ways. First, biological activity is boosted by moderately high temperatures (30 °C) found at the periphery of the heated area during active thermal treatment, and throughout the heated area as it cools. Second, high temperatures increase the solubility of DNAPL, resulting in an increase in contaminant concentrations in the dissolved form that the microbes are able to use, provided the concentrations of the dissolved COCs are not toxic to the microorganisms.

The remedial design will finalize the selection of thermal technology. The conceptual design used to develop initial costs assumed that 25 vapor extraction points will be used to a depth of 15 ft bgs using stainless steel material. Extraction would be conducted using a liquid ring vacuum pump and a thermal oxidizer would be used to treat the vapors. Air flow capacity is estimated at 4,000 cubic ft per minute.

Removal of residual DNAPL via thermal treatment and extraction will remove at least 99.9% according to the thermal vendors even within low permeability zones. Thermal treatment also enhances mobilization of organic matter from the soil to groundwater, which will act to enhance biodegradation of the COCs. Additionally, higher ambient soil temperature imposed by the thermal treatment process during startup and cool down periods will increase the biodegradation rate by a factor of 2 for every 10 °C increase in ambient soil temperature up to approximately 25 °C above which bacterial activity would decrease. Application of thermal treatment in the southern area of the UEP will also remove COCs in the unsaturated zone (e.g., area represented by 18CPT21) that would otherwise be subject to excavation. Therefore, the volume requiring excavation could be reduced by approximately 6,000 yd<sup>3</sup>.

Groundwater extraction near the thermally treated areas might have to be ceased temporarily to reduce the groundwater flux through the area, which requires additional heating capacity.





The presence of DNAPL in the ACD area may extend farther to the north toward ICT-12E and monitoring well 120, increasing the area to be treated for DNAPL. Therefore, the cost estimate for the DNAPL area in the vicinity of the ACD may become larger and will be considered during the RD phase.

**MNA for both shallow zone and Wilcox Formation groundwater for areas outside the influence of the treatment areas and for areas inside the influence of the treatment areas (after treatment).** For the MNA performance evaluation, USEPA 1999 is cited as the guiding document for evaluating effectiveness of MNA. A monitoring program will be designed and implemented to evaluate enhanced MNA of VOCs and perchlorate in the shallow zone inside and outside the containment area after completion of active remediation as may be necessary. The monitoring program will also monitor for COCs in the upper Wilcox Formation. LTM will be conducted to confirm that contaminant concentrations are being reduced to acceptable levels over time.

No NA information is available for Wilcox Formation wells at this time because the majority of Wilcox Formation wells that are impacted were installed since May 2013 and only two to three data points are available for these wells. New data will need to be evaluated for NA in the Wilcox Formation.

For this alternative, it is assumed that a monitoring program will be designed and implemented in accordance with USEPA guidance (USEPA, 1998; USEPA, 2004) to evaluate the effectiveness of NA at the Site. A total of 92 monitoring wells are currently available to provide groundwater data (32 Wilcox Formation wells and 60 shallow zone wells).

MNA sampling would be a part of groundwater monitoring plans. MNA sampling will be performed quarterly for the first two years, semi-annually for the next three years, annually for the next five years and then every two years. After that, the sampling frequency may be changed to once every five years if the data suggest less frequent sampling is appropriate. For costing purposes, a 30-year monitoring program is assumed. The analytical program will consist of VOCs, metals, perchlorate, and 1,4-dioxane, among others. The full list of MNA parameters would be developed during the RD phase. For cost estimating purposes, 4 Wilcox monitoring wells and 12 shallow monitoring wells were assumed for sampling (20 samples with QC). The MNA network is expected to be more expansive than assumed for costing purposes, and the locations and number of wells to be used for MNA will be developed during the RD phase.

Annual reports will be prepared to document the program. The second year annual report will include a review of the first eight rounds of sampling and provide the rationale for MNA as an effective part of the remedial alternative. Sampling frequency, reporting frequency, or analytical suite may be modified based on the results of the sampling program.

Major components of the MNA remedy include:

- **MNA to return groundwater to its potential beneficial use, wherever practicable.** Historic data suggest that NA of COCs is occurring at the Site; however, additional data collection is necessary to fully evaluate NA. Monitoring wells will be sampled for eight consecutive quarters to evaluate and confirm the occurrence of NA 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. If MNA is not found to be effective in areas outside of direct active treatment, a contingency remedy may be implemented. The contingency



remedy would be determined based on aquifer conditions at that time. The monitoring details associated with MNA will be presented in the RD.

- **Performance objectives to evaluate the MNA remedy performance after two 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 will 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) 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 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 to enhance MNA** to reach the RAOs if MNA is found to be ineffective. The area and the elements of the contingency remedy would be selected based on the entire data set available. The contingency remedy would consist of injection of bioremediation amendments to enhance degradation of the groundwater contaminants at selected locations based on data available at the time it is determined MNA is not successful. Development and specific description of the contingency remedy would be presented in a RD/RAWP.
- **Initiate LTM.** 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 three 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 would be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose would be evaluated at five year reviews.
- **Land Use Control.** The LUC objectives include maintaining the integrity of any current or future remedial or monitoring systems, maintaining the surface impoundment cap over the UEP, 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 U.S. 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 **Table 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 U.S. 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 USEPA and the 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. 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 2-18**.
  - 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 **Table 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 **Table 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.
  - The LUC for preserving the integrity of the surface impoundment cap shall include restrictions that prevent intrusive activities that may degrade or alter its effectiveness. Restrictions would include restricting intrusive activities (e.g., digging) that would degrade or alter the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.



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 U.S. Army-owned property, the U.S. Army will provide written notice of the LUCs 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 U.S. Army shall provide USEPA 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 U.S. 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 LUCs 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.

LUC implementation and maintenance actions will be described in the RD for LHAAP-18/24. The LUCs would be included in the property transfer documents and a recordation of them filed in the Harrison County Courthouse. The LUCs will prevent human exposure to groundwater contaminated with chlorinated solvents, explosives, metals, and perchlorate through the prohibition of groundwater use (except for environmental monitoring and testing), restrict land use to nonresidential, require maintenance of the integrity of any current or future remedial or monitoring systems and prevent the use of groundwater contaminated above cleanup levels as a potable water source. 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 ROD, the U.S. 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 USEPA 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.

Monitoring activities associated with the LUCs would be undertaken to confirm 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-18/24.

**Maintenance of the existing cap over the former UEP.** The closure cap over the UEP will be maintained in good condition, preventing erosion and maintaining vegetative cover to reduce infiltration in this area and prevent any contamination present in the unsaturated soil beneath the UEP from migrating to groundwater.

The former UEP was closed as a surface impoundment under RCRA in 1986 and capped by 1987. The UEP cap design consisted of removing the sludge, filling the UEP with common fill, covering the common fill with 4 ft of compacted clay, then applying 1 foot of sand, covered by 1 foot of topsoil. The surface of the cap has an average slope of three percent on top while the sides have a vertical to horizontal ratio of 1:4. It is graded and equipped with a sand drainage layer to promote sheet flow runoff to minimize erosion.

This cap would continue to be monitored, maintained, and repaired, as necessary, to ensure long-term effectiveness. This includes inspections of the cap 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 ensure that the integrity of the cap is maintained (e.g., mowing, seeding, and settlement/erosion repair). A LUC restricting intrusive activities would be implemented to ensure the integrity of the cap. These restrictions would remain in place until the underlying source soil is removed and/or the cleanup levels for soil listed in **Table 2-10** have been achieved.

The importance of maintaining the cap is to prevent contaminants present in the unsaturated soil from leaching to groundwater. Three locations within the UEP identified the presence of contaminants within the unsaturated zone above the water table (18CPT21, 18CPT25, and 18CPTUEP05). The highest contamination was reported in 18CPT21. The presence of the cap provides a significant protection of this soil as long as cap maintenance continues to minimize infiltration of rain water. The runoff water from the UEP cap will be drained to off-site locations to avoid infiltration of rain water inside the containment.

### 2.12.3 Cost Estimate of the Selected Remedy

**Table 2-12** presents the present worth analysis of the cost for the selected remedy, Alternative 5. 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. Changes will be documented in accordance with 40 CFR 300.435(c)(2) in the form of a memorandum in the Administrative Record, an Explanation of Significant Difference (ESD), or a ROD amendment, as necessary. 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, capital, and O&M costs for Alternative 5 is shown in **Table 2-12** below. The costs were developed using a discount rate of 3%. The O&M costs include evaluation of MNA, maintenance of the LUC, 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** presents the cleanup levels. The cleanup levels for the COCs in the groundwater are the Federal SDWA MCLs, or in the absence of federal drinking water standards, the cleanup level is the TRRP Tier 1 Groundwater Residential PCL (<sup>GW</sup>GW<sub>Ing</sub>). The cleanup level for the soil is the GWP-Ind MSC

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 (**Table 2-10**) is anticipated to be completed in approximately 20 years, however considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the time to achieve the cleanup levels may vary by an order of magnitude. This approximate timeframe to achieve cleanup levels is considered reasonable for the anticipated future land use as a national wildlife refuge. In the short-term (prior to the groundwater achieving cleanup levels), it is anticipated 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 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. Until that time, the LUC for groundwater will prohibit the use of the site's groundwater except for environmental monitoring and testing. When the groundwater remedial action goals are achieved, the LUC will be removed.

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<sub>o</sub> = 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 5, will achieve the RAOs for LHAAP-18/24. Implementation of the LUCs would restrict intrusive activities at the surface impoundment cap and prevent human access and exposure to contaminated soil beneath the cap and groundwater that poses an unacceptable risk to human health until the remedy achieves the RAOs. The LUCs would include land use notification at the Harrison County courthouse and periodic surveillance of LHAAP-18/24 to ensure that use restrictions are not being violated. The U.S. Army would include the notice with any transfer letter to the USFWS for the intended future use as a national wildlife refuge. If transferred out of U.S. government control, deed restrictions would be placed on the property to prohibit or restrict property uses that may result in exposure to groundwater (e.g., drinking water well installation). 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 (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) in soils and groundwater, have sufficiently degraded to levels that allow for unlimited use and unrestricted exposure.

With implementation of ISB on three sides outside the containment, in the Wilcox Formation, and inside the containment in five areas, removal of potential unsaturated source soils, ISTD remediation of secondary source areas in the saturated soil inside the containment area in two distinct areas (former UEP and former ACD), and enhanced groundwater extraction inside the containment as needed, this alternative should accelerate the process of achieving the RAOs. No reliance on NA is proposed for this alternative. Since NA is occurring at the site, its use as part of the remedy is inevitable. NA inside the containment is a feasible option to polish the residual COCs remaining after ISTD and ISB implementation are completed.

Groundwater use restrictions would remain in place until groundwater extraction, as needed and eventually NA reduces contaminant levels inside and outside the containment and in the Wilcox Formation to allow unrestricted use and unlimited exposure. The LUCs for soil and groundwater will be maintained 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 2-10**) in soil and groundwater allow for unlimited use and unrestricted exposure.

A monitoring program that would track the continual attenuation of the groundwater COCs and verify that contamination is not reaching Harrison Bayou will be implemented. The LTM program would provide information to support Five-Year Reviews and the termination of the remedy when cleanup levels have been met.

The treatment system and enhanced groundwater extraction, as needed, would continue to be operated to prevent migration of COCs from the containment area and reduce the concentrations of those COCs over time inside and outside the containment area. The treatment system and other active remedies would eventually achieve concentrations throughout the containment area and outside the containment area that could be addressed via NA.

### 2.13.2 Compliance with ARARS

The selected remedy complies with all ARARs. The ARARs and non-procedural considerations are presented below and in **Table 2-13**.



### Chemical-Specific ARARs

- Groundwater:** Cleanup levels are presented in **Table 2-10**. The cleanup goal for groundwater will be the SDWA MCLs as specified in 40 C.F.R. §§ 141.61 and 141.62, which meet health-based standards and criteria. In the absence of federal drinking water standards, clean-up levels will be based on TRRP Tier 1 Residential Groundwater PCLs.

This alternative will return the contaminated shallow and intermediate groundwater zones at LHAAP-18/24 to their potential beneficial use as drinking water, wherever practicable, given the particular circumstances of the site, which for the purposes of this ROD is considered to be attainment of the relevant and appropriate SDWA MCLs, and consistent with 40 C.F.R. § 300.430(e)(2)(i)(B&C). 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.
- Soil:** There are no federally promulgated chemical-specific ARARs for soil. The State of Texas promulgated cleanup standards under 30 TAC 335, Subchapter S, specifically 30 TAC 335.559 (g)(2) which specifies contaminant concentration limits for nonresidential soil and are used as the chemical-specific ARARs for the site soils. The concentrations represent the non-residential soil-to-groundwater cross-media protection concentrations that must be met to 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. It is anticipated that removal of contaminated soils above the Texas standards will prevent further 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 (CWA) where such goals and criteria are relevant and appropriate under the circumstances of the release or threatened release. Therefore, surface water quality criteria may be 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 C.F.R. §§ 122, 125, 129, and 130 – 131 and 30 TAC 307.4, 307.6, 307.7, 307.8 and 307.9 are considered potential future ARARs. 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 COCs that are not listed in Table 2 of 30 TAC §307.6(d)(1), the TRRP Tier 1 Residential Groundwater PCL for those COCs would apply.

The extracted groundwater will be treated to the levels established by TCEQ Water Quality Division. The treated water will be discharged to Harrison Bayou. **Table 2-14** identifies the current discharge criteria, however the discharge criteria will be established during the RD phase.

### Location-Specific ARARs

The discharge limits for extracted and treated groundwater, calculated by the TCEQ Water Quality Division, are also considered location-specific ARARs and discussed under the chemical-specific ARARs.





### Action-Specific ARARs

The selected remedy has potential action-specific ARARs related to the following activities: site preparation and soil excavation activities, waste 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 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 C.F.R. § 122.26), 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 and 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 nonhazardous waste. All solid waste (defined as any solid, liquid, semisolid, or contained gaseous material intended for discard (40 C.F.R. § 261.2) generated during remedial activities must be appropriately characterized to determine whether it contains RCRA hazardous waste (40 C.F.R. § 262.11; 30 TAC 335.62; 30 TAC 335.503(a)(4); 30 TAC 335.504). If feasible, secondary waste streams generated due to dewatering, well development activities, or from decontamination activities will be sent to the LHAAP-18/24 wastewater treatment facility for further treatment in accordance with applicable regulations. All wastes must be managed, stored, treated (if necessary), and disposed of in accordance with the ARARs for waste management listed in **Table 2-13** 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 provide ARARs for such actions and include 30 TAC 331, Subchapters A and H. Specific provisions 30 TAC §331.9(a); 30 TAC §331.10(a); 30 TAC



§331.10(d); 30 TAC §331.21; 30 TAC §331.132(a); 30 TAC §331.132(c); 30 TAC §331.132(d)(1); 30 TAC §331.132(d)(4); 30 TAC §331.133(e) apply. 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-18/24 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 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 C.F.R. § 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 C.F.R. §270.1(c)(2)(v); 40 C.F.R. § 264.1(g)(6); 30 TAC 335.429(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).
- Post-Closure Care.** Substantive requirements of closure and post-closure ARARs include 30 TAC 335.174 and 40 CFR § 264.228 addressing surface impoundments storing hazardous waste. Closure requirements were met during implementation of the cap. Post-closure requirements are relevant and appropriate, and include 40 CFR § 264.228(b)(1), (3) and (4). In addition, those substantive requirements of 40 CFR §§ 264.117-120 related to post-closure for the remedy in place are relevant and appropriate.

### Other Considerations

Activities that would be conducted under Alternative 5 are similar to current activities of groundwater extraction, treatment monitoring, and discharge and would comply with all procedural considerations described in **Table 2-13**. ISB source area remediation, and soil excavation will be implemented in areas that have already been disturbed. No activities would take place in sensitive environments such as wetlands, and no impacts to archeological resources or threatened and endangered species are anticipated. Compliance with the substantive requirements with waste generation, temporary storage, characterization, and off-site disposal are being carried out at this site and will be complied with during implementation of the remedy.



### 2.13.3 Cost-Effectiveness

**Table 2-12** presents the present worth analysis of the cost estimate for the selected remedy. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The capital cost for the selected remedy is \$19.52M, with O&M costs of \$13.13M, and total cost of \$32.667M. The quantities shown 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. The progression of total present value costs from the least expensive alternative to the most expensive alternative is as follows (provided no contingencies are implemented): Alternative 1, Alternative 3, Alternative 2, Alternative 4, Alternative 5, and Alternative 6.

There are no costs associated with Alternative 1 because no remedial activities would be conducted. Alternative 6 has highest capital costs due to the high cost of ZVI, but lower O&M costs than all other alternatives with the exception of Alternatives 3 and 5. Alternative 5 has an O&M cost over 20 years after which the GWTP and extraction would be shut down. Alternative 5 has a higher capital cost associated with thermal treatment compared to Alternatives 2, 3, and 4. Alternatives 2, 3, and 4 have the lowest capital costs of the active remedial alternatives, with Alternative 3 having the lowest capital cost associated with slurry wall construction and lowest O&M cost due to the greater cost reductions in O&M associated with reduction in GWTP operation and reduction in monitoring costs (this alternative does not require full extraction of groundwater). Alternatives 2, 4, and 6 have the highest O&M costs of all the alternatives because it is assumed that GWTP operations will continue for 30 years with no reduction in extraction rates.

Although Alternative 5 is not the least expensive alternative, it is expected to achieve site RAOs in the shortest period of time compared to the other alternatives. Costs for Alternatives 2, 4, and 5 differ by approximately \$2M, or vary from one another by approximately 5% or less, suggesting that cost may be a less significant differentiator for these alternatives than other criteria.

### 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 in-situ treatment and groundwater extraction, as needed would irreversibly reduce groundwater contaminant concentrations in the treated portions of the groundwater plume. MNA will reduce groundwater contaminants to cleanup levels. The LUC for the maintenance of the monitoring system will be maintained until the groundwater cleanup levels are achieved. The LUCs for soil and groundwater will be maintained 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 2-10**) allow for unlimited use and unrestricted exposure. 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).

The selected remedy would provide reduction in toxicity, mobility, and volume of the groundwater contaminants via active treatment of the most contaminated areas. The selected remedy would



document effectiveness through the confirmation of MNA and the routine monitoring of the attenuation and migration of the contaminants in groundwater.

The selected remedy would provide immediate protection because the LUCs would be implemented quickly. Maintenance of this control would be required until COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 2-10**) and by-product (daughter) contaminant concentrations in soil and groundwater allow 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 ISTD and EISB as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. In addition, there is a potential principal source threat at LHAAP-18/24 residing as residual DNAPLs in groundwater. The DNAPLs will be addressed during remediation with ISTD.

### 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-18/24 was released for public comments on April 2, 2019. The Proposed Plan identified Alternative 5 as the Preferred Alternative for groundwater remediation.

Verbal comments were discussed during the public meeting held on April 25, 2019, and the U.S. Army provided responses as recorded in the meeting transcript, available in the Administrative Record (<http://www.longhornaap.com/admin-record>). The U.S. Army reviewed all written comments submitted during the public comment period. 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 at that time.



**Table 2-1. Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations**

| Scenario Timeframe:                   |                                  | Current                                    |          |                        |                                     |                     |
|---------------------------------------|----------------------------------|--|----------|------------------------|-------------------------------------|---------------------|
| Medium:                               |                                  | Groundwater                                |          |                        |                                     |                     |
| Exposure Medium:                      |                                  | Groundwater                                |          |                        |                                     |                     |
| Exposure Point                        | Chemical                         | Concentration Detected <sup>1</sup> (mg/L) |          | Frequency of Detection | Exposure Point Concentration (mg/L) | Statistical Measure |
|                                       |                                  | Minimum                                    | Maximum  |                        |                                     |                     |
| Ingestion, inhalation, dermal contact | <b><i>Dioxin/Furan</i></b>       |  |          |                        |                                     |                     |
|                                       | 2,3,7,8-TCDD TEC                 |  |          | ---                    | 2.32E-09                            | maximum             |
|                                       | <b><i>Explosives</i></b>         |  |          |                        |                                     |                     |
|                                       | 2,4-Dinitrotoluene               | ND   | ND       | 0/4                    | 5.30E-01                            | maximum             |
|                                       | 1,3,5-Trinitrobenzene            | 0.001                                      | 0.001    | 1/6                    | 1.00E00                             |                     |
|                                       | 2,6-Dinitrotoluene               | ND   | ND       | 0/4                    | 5.30E-01                            | maximum             |
|                                       | 4-Nitrotoluene                   | ND   | ND       | 0/4+                   | 2.10E+00                            | maximum             |
|                                       | <b><i>Metals</i></b>             |  |          |                        |                                     |                     |
|                                       | Antimony                         | 0.012                                      | 0.333    | 5/26                   | 3.33E-01                            | maximum             |
|                                       | Barium                           | 0.039                                      | 6.0      | 25/26                  | 6.00E+00                            | maximum             |
|                                       | Chromium                         | 0.01                                       | 18.0     | 20/26                  | 1.8E+01                             | maximum             |
|                                       | Cobalt                           | 0.11                                       | 0.28     | 2/6                    | 2.8E-01                             |                     |
|                                       | Lead                             | 0.002                                      | 0.018    | 9/26                   | 1.8E-02                             | maximum             |
|                                       | Manganese                        | 0.022                                      | 2.41     | 6/6                    | 8.27E+00                            | maximum             |
|                                       | Nickel                           | 0.044                                      | 9.6      | 7/26                   | 9.60E+00                            | maximum             |
|                                       | Silver                           | 0.01                                       | 0.48     | 4/26                   | 4.8E-01                             | maximum             |
|                                       | Strontium                        | 0.12                                       | 4.4      | 6/6                    | 4.4E+00                             | maximum             |
|                                       | Thallium                         | 0.0017                                     | 0.0037   | 6/26                   | 3.70E-03                            | maximum             |
|                                       | <b><i>Non-Metallic Anion</i></b> |  |          |                        |                                     |                     |
|                                       | Perchlorate                      | 8.00E-03                                   | 8.80E+01 | 13/30                  | 6.90E+01                            | maximum             |
|                                       | <b><i>Volatile Organics</i></b>  |  |          |                        |                                     |                     |
|                                       | Bromodichloromethane             | 0.005                                      | 0.007    | 3/26                   | 7.0E-03                             | maximum             |
|                                       | Chloroform                       | 0.009                                      | 0.028    | 6/26                   | 2.80E-02                            | maximum             |
|                                       | cis-1,2-Dichloroethene           | 0.250                                      | 0.250    | 1/6                    | 2.50E-01                            | maximum             |
|                                       | Methylene chloride               | 0.0029                                     | 730      | 8/26                   | 7.30E+03                            | maximum             |
|                                       | Toluene                          | 0.003                                      | 0.003    | 1/26                   | 3.00E-03                            | maximum             |
|                                       | Trichloroethene                  | 0.0039                                     | 210      | 8/26                   | 2.10E+02                            | Maximum             |



**Table 2-1. Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations (continued)**

| Scenario Timeframe:                   |                               | Current                                    |          |                        |                                     |                     |
|---------------------------------------|-------------------------------|--|----------|------------------------|-------------------------------------|---------------------|
| Medium:                               |                               | Soil                                       |          |                        |                                     |                     |
| Exposure Medium:                      |                               | Soil (0 to 0.5 feet below ground surface)  |          |                        |                                     |                     |
| Exposure Point                        | Chemical                      | Concentration Detected <sup>1</sup> (mg/L) |          | Frequency of Detection | Exposure Point Concentration (mg/L) | Statistical Measure |
|                                       |                               | Minimum                                    | Maximum  |                        |                                     |                     |
| Ingestion, inhalation, dermal contact | <i>Dioxin/Furan</i>           |  |          |                        |                                     |                     |
|                                       | 2,3,7,8-TCDD TEC              | 2.63E-07                                   | 7.71E-06 | ---                    | 1.79E-06                            | maximum             |
|                                       | <i>Metals</i>                 |  |          |                        |                                     |                     |
|                                       | Barium                        |  |          |                        | 2.81E+02                            | 95% UCL             |
|                                       | Lead                          |  |          |                        | 1.29E+03                            | maximum             |
|                                       | Mercury                       | 0.12                                       | 0.22     | 3/75                   | 1.10E+00                            | maximum             |
|                                       | Thallium                      |  |          |                        | 2.14E+00                            | maximum             |
|                                       | <i>Semi-Volatile Organics</i> |  |          |                        |                                     |                     |
|                                       | Benzo(b)fluoranthene          | 2.45E-02                                   | 7.03E-02 | 5/6                    | 7.50E-01                            | maximum             |

<sup>1</sup> 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) <sup>-1</sup> | Dermal Cancer Slope Factor (mg/kg-day) <sup>-1</sup> | Weight of Evidence/ Carcinogen Guideline Description | Source/ Date |
| <b>Dioxin/Furans</b>               |  |  |  |              |
| 2,3,7,8-TCDD TEC                   | 1.50E+05   | 3.00E+05   | Not Classified                                       | ---          |
| <b>Explosives</b>                  |  |  |  |              |
| 1,3,5-Trinitrobenzene              | NTV  | NTV  | Not Classified                                       |              |
| 2,4-Dinitrotoluene                 | 6.80E-01   | 8.00E-01   | B2   | TCEQ, 2001   |
| 2,6-Dinitrotoluene                 | 6.80E-01   | 8.00E-01   | B2   | TCEQ, 2001   |
| 4-Nitrotoluene                     | NTV  | NTV  | Not Classified                                       | ---          |
| <b>Metals</b>                      |  |  |  |              |
| Antimony                           | NTV  | NTV  | Not Classified                                       | ---          |
| Barium                             | NC   | NC   | D  | TCEQ, 2001   |
| Chromium (total)                   | NC   | NC   | Not Classified                                       | ---          |
| Cobalt                             |  |  |  |              |
| Lead                               | NTV  | NTV  | Not Classified                                       | ---          |
| Manganese (non-diet)               | NC   | NC   | D  | TCEQ, 2001   |
| Mercury                            | 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                                       | ---          |
| <b>Non-Metallic Anions</b>         |  |  |  |              |
| Perchlorate                        | NTV  | NTV  | Not Classified                                       | ---          |
| <b>Semi-Volatile Organics</b>      |  |  |  |              |
| Benzo(b)fluoranthene               | 7.3E-01  | 8.2E-01  | B2   | TNRCC, 2001  |
| <b>Volatile Organics</b>           |  |  |  |              |
| Bromodichloromethane               | 6.20E-02   | 6.33E-02   | B2   | TCEQ, 2001   |
| Chloroform                         | 6.10E-03   | 3.05E-02   | B2   | TCEQ, 2001   |
| cis-1,2-Dichloroethene             | NC   | NC   | D  | TCEQ, 2001   |
| Methylene chloride                 | 7.50E-03   | 7.89E-03   | B2   | TCEQ, 2001   |
| Trichloroethene                    | 1.10E-02   | 1.10E-02   | B2   | TCEQ, 2001   |

| Pathway: Inhalation   |   |  |             |
|-----------------------|---|--|-------------|
| Chemical of Concern   | Unit Risk Factor (mg/m <sup>3</sup> ) <sup>-1</sup> | Weight of Evidence/ Carcinogen Guideline Description | Source/Date |
| <b>Dioxin/Furans</b>  |   |  |             |
| 2,3,7,8-TCDD TEC      | 3.30E+04  | Not Classified                                       | ---         |
| <b>Explosives</b>     |   |  |             |
| 1,3,5-Trinitrobenzene | NTV   | Not Classified                                       | ---         |
| 2,4-Dinitrotoluene    | NTV   | B2   | TNRCC, 2001 |
| 2,6-Dinitrotoluene    | NTV   | B2   | TNRCC, 2001 |
| 4-Nitrotoluene        | NTV   | Not Classified                                       | ---         |





**Table 2-2. Carcinogenic Toxicity Data Summary (continued)**

| Pathway: Inhalation (cont'd.) |   |  |             |
|-------------------------------|---|--|-------------|
| Chemical of Concern           | Unit Risk Factor (mg/m <sup>3</sup> ) <sup>-1</sup> | Weight of Evidence/ Carcinogen Guideline Description | Source/Date |
| <b>Metals</b>                 |   |  |             |
| Aluminum                      | NTV   | Not Classified                                       | ---         |
| Antimony                      | NTV   | Not Classified                                       | ---         |
| Barium                        | NC  | D  | TNRCC, 2001 |
| Chromium (total)              | NC  | Not Classified                                       | ---         |
| Lead                          | NTV   | Not Classified                                       | ---         |
| Manganese (Non-diet)          | NC  | D  | TNRCC, 2001 |
| Mercury                       | NC  | D  | TNRCC, 2001 |
| Nickel                        | 4.80E-01  | A  | TNRCC, 2001 |
| Silver                        | NC  | D  | TCEQ, 2001  |
| Strontium                     | NTV   | Not Classified                                       | ---         |
| Thallium                      | NC  | Not Classified                                       | ---         |
| <b>Non-Metallic Anions</b>    |   |  |             |
| Perchlorate                   | NTV   | Not Classified                                       | ---         |
| <b>Semi-Volatile Organics</b> |   |  |             |
| Benzo(b)fluoranthene          | 8.80E-02  | B2   | TNRCC, 2001 |
| <b>Volatile Organics</b>      |   |  |             |
| 1,2-Dichloroethane            | 2.60E-02  | B2   | TNRCC, 2001 |
| Bromodichloromethane          | NTV   | B2   | TNRCC, 2001 |
| Chloroform                    | 2.30E-02  | B2   | TNRCC, 2001 |
| cis-1,2-Dichloroethene        | NC  | D  | TNRCC, 2001 |
| Methylene chloride            | 4.70E-04  | B2   | TNRCC, 2001 |
| Toluene                       | NC  | D  | TNRCC, 2001 |
| Trichloroethene               | 1.70E-03  | B2   | TNRCC, 2001 |

**Notes:**

--- : No information available

mg/kg-day: milligrams per kilogram per day

mg/m<sup>3</sup>: 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.

TNRCC), 2001, Update to 1998 Consistency Memorandum. Toxicity Factors Table, 15 March 2001. .

**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/<br>Subchronic | Oral RfD<br>Value<br>(mg/kg-day) | Dermal<br>RfD<br>(mg/kg-day) | Target<br>Endpoint                        | Combined<br>Uncertainty/<br>Modifying<br>Factors | Source/Date       |
| <b>Dioxin/Furans</b>               |                        |                                  |                              |   |  |                   |
| 2,3,7,8-TCDD TEC                   | chronic                | NTV                              | NTV                          | NA  | NA   | ---               |
| <b>Explosives</b>                  |                        |                                  |                              |   |  |                   |
| 1,3,5-Trinitrobenzene              | chronic                | 3.00E-02                         | 1.95E-02                     | Methemoglobinemia and splenomegaly        | 100/1  | USEPA-IRIS, 2001  |
| 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 |
| 4-Nitrotoluene                     | chronic                | 1.00E-02                         | 5.00E-03                     | Spleen lesions                            | 10000/1  | USEPA-HEAST, 1997 |
| <b>Metals</b>                      |                        |                                  |                              |   |  |                   |
| Aluminum                           | chronic                | 1.00E+00                         | 1.00E-01                     | NA  | NA   | ---               |
| 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  |
| Beryllium                          | chronic                | 2.00E-03                         | 1.40E-05                     | Small Intestine                           | 300/1  | 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  |
| Mercury                            | chronic                | 3.00E-04                         | 2.10E-05                     | Autoimmune effects                        | 1000/1   | 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  |
| Pathway: Ingestion, Dermal Contact |                        |                                  |                              |   |  |                   |
| <b>Non-Metallic Anions</b>         |                        |                                  |                              |   |  |                   |
| Perchlorate                        | chronic                | 9.00E-04                         | 9.00E-04                     | NA  | NA   | ---               |
| <b>Semi-Volatile Organics</b>      |                        |                                  |                              |   |  |                   |
| Benzo(b) fluoranthene              | chronic                | NTV                              | NTV                          | NA  | NA   |                   |
| <b>Volatile Organics</b>           |                        |                                  |                              |   |  |                   |
| 1,2-Dichloroethane                 | chronic                | 3.00E-02                         | 3.00E-02                     | NA  | NA   | ---               |
| Bromodichloromethane               | chronic                | 2.00E-02                         | 1.96E-02                     | Renal cytomegaly                          | 1000/1   | USEPA-IRIS, 2001  |



**Table 2-3. Non-Carcinogenic Toxicity Data Summary (continued)**

| Pathway: Ingestion, Dermal Contact (cont'd.) |                        |                               |                           |  |  |                     |
|--|------------------------|-------------------------------|---------------------------|--|--|---------------------|
| Chemical of Concern                          | Chronic/<br>Subchronic | Oral RfD Value<br>(mg/kg-day) | Dermal RfD<br>(mg/kg-day) | Target<br>Endpoint   | Combined<br>Uncertainty/<br>Modifying<br>Factors | Source/Date         |
| Volatile Organics (cont'd.)                  |                        |                               |                           |  |  |                     |
| Chloroform                                   | chronic                | 1.00E-02                      | 2.00E-03                  | Cyst formation<br>in the liver                               | 1000/1   | USEPA-IRIS,<br>2001 |
| cis-1,2-Dichloroethene                       | chronic                | 1.00E-02                      | 1.00E-02                  | Decreased<br>hematocrit<br>and<br>hemoglobin in<br>the blood | 3000/1   | USEPA-IRIS,<br>2001 |
| Methylene<br>chloride                        | chronic                | 6.00E-02                      | 5.70E-02                  | Liver toxicity   | 100/1  | USEPA-IRIS,<br>2001 |
| Toluene                                      | chronic                | 2.00E-01                      | 1.6E-01                   | Liver and<br>kidney effects                                  | 1000/1   | USEPA-IRIS,<br>2001 |
| Trichloroethene                              | chronic                | 6.00E-03                      | 6.00E-03                  | NA   | NA   | ---                 |

| Pathway: Inhalation   |                        |                           |  |  |                       |  |
|-----------------------|------------------------|---------------------------|--|--|-----------------------|--|
| Chemical of Concern   | Chronic/<br>Subchronic | Inhalation RfC<br>(mg/m³) | Target<br>Endpoint                                       | Combined<br>Uncertainty/<br>Modifying<br>Factors | Source/<br>Date       |  |
| Dioxin/Furans         |                        |                           |  |  |                       |  |
| 2,3,7,8-TCDD TEC      | chronic                | NTV                       | ---  | ---  | ---                   |  |
| Explosives            |                        |                           |  |  |                       |  |
| 1,3,5-Trinitrobenzene | NTV                    | -                         | -  | -  | -                     |  |
| 2,4-Dinitrotoluene    | chronic                | 0.00015                   | NA   | NA   | ---                   |  |
| 2,6-Dinitrotoluene    | chronic                | 0.00015                   | NA   | NA   | ---                   |  |
| 4-Nitrotoluene        | chronic                | 0.011                     | NA   | NA   | ---                   |  |
| Metals                |                        |                           |  |  |                       |  |
| Aluminum              | chronic                | 0.0035                    | NA   | NA   | ---                   |  |
| Antimony              | chronic                | 0.0005                    | Pulmonary toxicity, chronic<br>interstitial inflammation | 300/1  | USEPA-IRIS,<br>2001   |  |
| Barium                | chronic                | 0.00049                   | Fetus, developmental<br>effects                          | 1000/1   | USEPA-<br>HEAST, 1997 |  |
| Chromium (total)      | chronic                | 0.0001                    | NA   | NA   | ---                   |  |
| Cobalt                | chronic                | 0.0000175                 | BA   | NA   |                       |  |
| Lead                  | chronic                | NTV                       | ---  | ---  | ---                   |  |
| Manganese (non-diet)  | chronic                | 0.00005                   | Impairment of<br>neurobehavioral function                | 1000/1   | USEPA-IRIS,<br>2001   |  |
| Mercury               | chronic                | 0.0003                    | Hand tremor, memory loss                                 | 30/1   | USEPA-IRIS,<br>2001   |  |
| Nickel                | chronic                | 0.0002                    | Respiratory effects                                      | NA   | ATSDR, 1997           |  |
| Silver                | chronic                | 0.00001                   | NA   | NA   | ---                   |  |
| Strontium             | chronic                | NTV                       | ---  | ---  | ---                   |  |
| Thallium              | chronic                | 0.0001                    | NA   | NA   | ---                   |  |



**Table 2-3. Non-Carcinogenic Toxicity Data Summary (continued)**

| Pathway: Inhalation (cont'd.)     |                        |  |                      |  |                        |
|-----------------------------------|------------------------|--|----------------------|--|------------------------|
| Chemical of Concern               | Chronic/<br>Subchronic | Inhalation RfC<br>(mg/m <sup>3</sup> ) | Target<br>Endpoint   | Combined<br>Uncertainty/<br>Modifying<br>Factors | Source/<br>Date        |
| <b>Non-Metallic Anions</b>        |                        |  |                      |  |                        |
| Perchlorate                       | chronic                | NTV                                    | ---                  | ---  | ---                    |
| <b>Semi-Volatile<br/>Organics</b> |                        |  |                      |  |                        |
| Benzo(b)fluoranthene              | NTV                    | --                                     | --                   | --   | --                     |
| <b>Volatile Organics</b>          |                        |  |                      |  |                        |
| Bromodichloromethane              | chronic                | NTV                                    | ---                  | ---  | ---                    |
| Chloroform                        | chronic                | 0.000301                               | NA                   | NA   | ---                    |
| cis-1,2-Dichloroethene            | chronic                | 0.793                                  | NA                   | NA   | ---                    |
| Methylene chloride                | chronic                | 3                                      | Liver toxicity       | 100/1  | USEPA-<br>HEAST, 1997  |
| Toluene                           | chronic                | 0.4                                    | Neurological effects | 300/1  | USEPA-IRIS,<br>2001--- |
| Trichloroethene                   | chronic                | NTV                                    | ---                  | ---  | ---                    |

**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<sup>3</sup>: milligrams per cubic meter

NA: Information not available

NTV: No toxicity value available

RfC: Reference concentration

RfD: Reference dose

TCDD: tetrachlorodibenzo-p-dioxin

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.

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.

**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 reference 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      | Carcinogenic Risk |            |                  |                       |
|                          |                       |  |                          | Ingestion         | Inhalation | Dermal           | Exposure Routes Total |
| Ground-water             | Ground-water          | Ingestion or exposure through showering                              | <i>Dioxin/Furan</i>      |                   |            |                  |                       |
|                          |                       |  | 2,3,7,8-TCDD TEC         | 1.2E-06           | NE         | 1.0E-05          | 1.1E-05               |
|                          |                       |  | <i>Pesticides</i>        |                   |            |                  |                       |
|                          |                       |  | 4,4'-DDD                 | 5.8E-07           | NE         | 7.6E-07          | 1.3E-06               |
|                          |                       |  | <i>Volatile Organics</i> |                   |            |                  |                       |
|                          |                       |  | Bromodichloromethane     | 1.5E-06           | NTV        | 7.8E-07          | 2.3E-06               |
|                          |                       |  | Chloroform               | 6.0E-07           | 3.9E-05    | 2.3E-06          | 4.2E-05               |
|                          |                       |  | Methylene chloride       | 1.9E-01           | 2.1E-01    | NE<br>(Kp<=0.01) | 4.0E-01               |
|                          |                       |  | Trichloroethene          | 8.1E-03           | 2.3E-01    | 1.1E-02          | 4.4E-01               |
| Groundwater risk total = |                       |  |                          |                   |            |                  | 4.4E-01               |
| Soil<br>(0 to 0.5 feet)  | Soil and particulates | Incidental Ingestion, inhalation of particulates, and dermal contact | <i>Dioxin/Furan</i>      |                   |            |                  |                       |
|                          |                       |  | 2,3,7,8-TCDD TEC         | 9.4E-08           | 3.1E-12    | 3.6E-08          | 1.3E-07               |
|                          |                       |  | <i>Semi-volatiles</i>    |                   |            |                  |                       |
|                          |                       |  | Benzo(b)fluoranthene     | 1.9E-07           | 3.5E-12    | 1.8E-07          | 3.7E-07               |
| Soil risk total =        |                       |  |                          |                   |            |                  | 5.0E-07               |

**Notes:**

|              |  |
|--------------|--|
| Kp           | Dermal permeability coefficient  |
| NA           | Not applicable   |
| 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-18/24. 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  $4.4 \times 10^{-01}$ . A risk below  $1 \times 10^{-4}$  is generally considered to be acceptable (USEPA, 1989). The total groundwater risk is 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 End-point | Non-Carcinogenic Hazard Quotient |            |               |                       |
|                                  |                 |   |                            |                  | Ingestion                        | Inhalation | Dermal        | Exposure Routes Total |
| Ground-water                     | Ground-water    | Ingestion or exposure through showering | <b>Explosive</b>           |                  |                                  |            |               |                       |
|                                  |                 |   | 1,3,5-Trinitrobenzene      |                  | 3.3E-01                          | NE         | NE (Kp<=0.01) | 3.3E-01               |
|                                  |                 |   | <b>Metals</b>              |                  |                                  |            |               |                       |
|                                  |                 |   | Antimony                   |                  | 8.1E+00                          | NE         | NE (Kp<=0.01) | 8.1E+00               |
|                                  |                 |   | Barium                     |                  | 8.4E-01                          | NE         | NE (Kp<=0.01) | 8.4E-01               |
|                                  |                 |   | Chromium (total)           |                  | 1.2E-01                          | NE         | NE (Kp<=0.01) | 1.2E-01               |
|                                  |                 |   | Cobalt                     |                  | 1.4E-01                          | NE         | NE (Kp<=0.01) | 1.4E-01               |
|                                  |                 |   | Manganese                  |                  | 1.7E+00                          | NE         | NE (Kp<=0.01) | 1.7E+00               |
|                                  |                 |   | Nickel                     |                  | 4.7E+00                          | NE         | NE (Kp<=0.01) | 4.7E+00               |
|                                  |                 |   | Silver                     |                  | 9.4E-01                          | NE         | NE (Kp<=0.01) | 9.4E-01               |
|                                  |                 |   | Strontium                  |                  | 7.2E-02                          | NE         | NE (Kp<=0.01) | 7.2E-02               |
|                                  |                 |   | Thallium                   |                  | 4.5E-01                          | NE         | NE (Kp<=0.01) | 4.5E-01               |
|                                  |                 |   | <b>Non-metallic Anions</b> |                  |                                  |            |               |                       |
|                                  |                 |   | Perchlorate                |                  | 7.5E+02                          | NE         | NE (Kp<=0.01) | 7.5E+02               |
|                                  |                 |   | <b>Volatiles</b>           |                  |                                  |            |               |                       |
|                                  |                 |   | Bromodichloromethane       |                  | 3.4E-03                          | NTV        | 1.8E-03       | 5.2E-03               |
|                                  |                 |   | Chloroform                 |                  | 2.7E-02                          | 1.6E+01    | 1.1E-01       | 1.6E+01               |
|                                  |                 |   | Cis-1,2-dichloroethene     |                  | 2.4E-01                          | 5.4E-02    | NE (Kp<=0.01) | 3.0E-01               |
|                                  |                 |   | Methylene chloride         |                  | 1.2E+03                          | 4.2E+02    | NE (Kp<=0.01) | 1.6E+03               |
|                                  |                 |   | Toluene                    |                  | 1.5E-04                          | 1.3E-03    | 2.8E-05       | 1.5E-03               |
|                                  |                 |   | Trichloroethene            |                  | 3.4E+02                          | NTV        | 4.6E+02       | 8.0E+02               |
| Groundwater Hazard Index Total = |                 |   |                            |                  |                                  |            |               | 3.2E+03               |



**Table 2-5. Risk Characterization Summary – Non-Carcinogens (continued)**

| 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 0.5 feet)                        | Soil and particulates | Incidental ingestion, inhalation of particulates, dermal contact | Metals              |                 |                                  |            |         |                       |
|   |                       |  | Barium              |                 | 3.9E-03                          | 8.5E-05    | 3.6E-03 | 7.6E-03               |
|   |                       |  | Mercury             |                 | 3.6E-03                          | 5.4E-07    | 3.3E-03 | 6.9E-03               |
|   |                       |  | Thallium            |                 | 2.6E-02                          | 3.2E-06    | 1.7E-03 | 2.8E-02               |
| Soil Hazard Index Total =                   |                       |  |                     |                 |                                  |            |         | 4.2E-02               |
| Hazard Index Total (soil and groundwater) = |                       |  |                     |                 |                                  |            |         | 3.2E+03               |

**Notes:**

|               |  |
|---------------|--|
| CNS           | central nervous system   |
| Kp            | Dermal permeability coefficient  |
| 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.

**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-18/24. 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 3.2E+03 and for soil is 4.2E-02. These values indicate that the potential for adverse non-carcinogenic effects could occur from exposure to groundwater.



**Table 2-6. Chemicals Contributing to Carcinogenic Risk in Shallow Zone Groundwater**

| Chemical   | ELCR <sup>a</sup>    | EPC <sup>a</sup><br>(µg/L) | Well                | Revised<br>ELCR  | Recent Maximum<br>(µg/L) | Date     | Well  | MCL<br>(µg/L)        | TRRP<br>PCL<br>(µg/L) | Retained<br>as a<br>COC? |
|--|----------------------|----------------------------|---------------------|------------------|--------------------------|----------|-------|----------------------|-----------------------|--------------------------|
| Methylene chloride                               | 4.0×10 <sup>-1</sup> | 7,300,000                  | MW-2                | b                | 21,300                   | 06/24/16 | MW-2  | 5                    | —                     | Yes, 1                   |
| Trichloroethene                                  | 4.1×10 <sup>-2</sup> | 210,000                    | MW-2                | b                | 17,100                   | 06/16/16 | 120   | 5                    | —                     | Yes, 1                   |
| 2,3,7,8-TCDD                                     | 1.1×10 <sup>-5</sup> | 530                        | 95 UCL <sup>d</sup> | None More Recent |                          |          |       | 3.0×10 <sup>-5</sup> | —                     | No, 2                    |
| 4,4'-DDD   | 1.3×10 <sup>-6</sup> | 59                         | MW-2                | None More Recent |                          |          |       | —                    | 3.8                   | No, 2                    |
| Tetrachloroethene <sup>3</sup>                   | —                    | —                          | —                   | —                | 85.1                     | 06/24/16 | MW-2  | 5                    | —                     | Yes, 1                   |
| Benzene <sup>3</sup>                             | —                    | —                          | —                   | —                | < 62.6                   | 06/24/16 | MW-2  | 5                    | —                     | Yes, 1                   |
| 1,1,2-Trichloroethane <sup>3</sup>               | —                    | —                          | —                   | —                | < 50                     | 06/07/16 | AWD1B | 5                    | —                     | Yes, 1                   |
| Vinyl Chloride <sup>3</sup>                      | —                    | —                          | —                   | —                | 256                      | 06/07/16 | AWD-1 | 2                    | —                     | Yes, 1                   |
| 1,4-Dioxane <sup>3</sup>                         | —                    | 61.7                       | 95 UCL <sup>d</sup> | —                | 412                      | 06/07/16 | MW-14 | —                    | 9.1                   | Yes, 1                   |
| Chloroform <sup>d</sup>                          | 4.2×10 <sup>-5</sup> | 28                         | 95 UCL <sup>d</sup> | b                | 58.1                     | 06/24/16 | MW-2  | —                    | 240                   | No, 2, 4                 |
| <b>Chemicals Retained on a Provisional Basis</b> |                      |                            |                     |                  |                          |          |       |                      |                       |                          |
| Bromodichloromethane <sup>c</sup>                | 2.3×10 <sup>-6</sup> | 530                        | 18WW09              | b                | < 125                    | 06/24/16 | MW-2  | —                    | 15                    | Yes, 1                   |

**Notes and Abbreviations:**

1. Identified as a COC since EPC and/or Recent Results are above the MCL or PCL.
2. Combined Shallow Zone ELCR of Chemicals with no MCL is within acceptable range of 1×10<sup>-6</sup> to 1×10<sup>-4</sup>.
3. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events.
4. Excluded as a COC as maximum concentration in the shallow zone is below MCL/PCL.

a. From Baseline Risk Assessment Table C-53 (Jacobs, 2002).

b. Revised ELCR not calculated for chemicals with an MCL.

c. All other wells were < 15 ug/L (the majority were below detection). Bromodichloromethane will be re-evaluated when data with lower reporting limit are obtained for MW-2.

d. Using ProUCL for the results of samples collected in June 2016.

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC contaminant of concern

ELCR excess lifetime cancer risk

EPC exposure point concentration

TRRP PCL Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level

MCL maximum contaminant level from the Safe Drinking Water Act

µg/L micrograms per liter

µg/L micrograms per liter

COC contaminant of concern

EPC exposure point concentration

MCL Safe Drinking Water Act maximum contaminant level

**Table 2-7. Chemicals Contributing to Carcinogenic Risk in Wilcox Formation Groundwater**

| Chemical   | Shallow Zone ELCR <sup>a</sup> | Shallow Zone EPC <sup>a</sup> (µg/L) | Shallow Zone Well   | Recent Maximum in Wilcox Formation (µg/L) | Date       | Well        | MCL (µg/L)           | TRRP PCL (µg/L) | Retained as a COC? |
|--|--------------------------------|--------------------------------------|---------------------|---|------------|-------------|----------------------|-----------------|--------------------|
| Methylene chloride                               | 4.0×10 <sup>-1</sup>           | 7,300,000                            | MW-2                | 746                                       | 06/24/2016 | 18CPTMW01SW | 5                    | —               | Yes, 1             |
| Trichloroethene                                  | 4.1×10 <sup>-2</sup>           | 210,000                              | MW-2                | 15,900                                    | 06/07/2016 | MW-14B      | 5                    | —               | Yes, 1             |
| 2,3,7,8-TCDD                                     | 1.1×10 <sup>-5</sup>           | 530                                  | 95 UCL              | —   | —          | —           | 3.0×10 <sup>-5</sup> | —               | No, 2              |
| 4,4'-DDD   | 1.3×10 <sup>-6</sup>           | 59                                   | MW-2                | —   | —          | —           | —                    | 3.8             | No, 2              |
| Benzene <sup>3</sup>                             | —                              | —                                    | —                   | 6.13                                      | 06/08/2016 | 18CPTMW03SW | 5                    | —               | Yes, 1             |
| 1,1,2-Trichloroethane <sup>3</sup>               | —                              | —                                    | —                   | 0.858                                     | 06/15/2016 | 18CPTMW23   | 5                    | —               | No, 5              |
| Vinyl Chloride <sup>3</sup>                      | —                              | —                                    | —                   | 8.97                                      | 06/08/2016 | 18CPTMW08SW | 2                    | —               | Yes, 1             |
| 1,4-Dioxane <sup>3</sup>                         | —                              | 61.7                                 | 95 UCL <sup>c</sup> | 412                                       | 06/07/16   | MW-14B      | —                    | 9.1             | Yes, 1             |
| Chloroform                                       | 4.2×10 <sup>-5</sup>           | 28                                   | 95 UCL              | 13.2                                      | 06/07/16   | MW-14B      | —                    | 240             | No, 2,5            |
| <b>Chemicals Retained on a Provisional Basis</b> |                                |                                      |                     |   |            |             |                      |                 |                    |
| Tetrachloroethene                                | —                              | —                                    | —                   | < 50                                      | 06/07/2016 | MW-14B      | 5                    | —               | Yes, 4             |
| Bromodichloromethane <sup>b</sup>                | 2.3×10 <sup>-6</sup>           | 530                                  | 18WW09              | < 40                                      | 06/07/16   | MW-14B      | —                    | 15              | Yes, 4             |

**Notes and Abbreviations:**

1. Identified as a COC since recent results are above the MCL or PCL and the compound is identified as a COC in the Shallow Zone.
2. Combined Shallow Zone ELCR of Chemicals with no MCL is within acceptable range of 1×10<sup>-6</sup> to 1×10<sup>-4</sup>.
3. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events.
4. Identified as a COC due to high reporting limit in Wilcox Formation well(s) and presence in shallow zone groundwater. Retained on a provisional basis.
5. Excluded as a COC as maximum concentration in Wilcox Formation is below MCL/PCL.

a. From Baseline Risk Assessment Table C-53 (Jacobs, 2002).

b. All other wells were < 15 µg/L (the majority were below detection). Bromodichloromethane will be re-evaluated when data with lower reporting limit are obtained.

c. Using ProUCL for the results of samples collected in June 2016.

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC contaminant of concern

ELCR excess lifetime cancer risk

EPC exposure point concentration

TRRP PCL Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level

MCL maximum contaminant level from the Safe Drinking Water Act

µg/L micrograms per liter

B Sample collected from the bottom of well screen





**Table 2-8 Chemicals with Hazard Quotient Greater than 0.1 in Shallow Zone Groundwater**

| Chemical   | HQ   | EPC <sup>a</sup><br>(µg/L) | Well                | Revised<br>HQ  | Recent<br>Maximum<br>(µg/L) | Date                 | Well                   | MCL<br>(µg/L) | TRRP<br>PCL<br>(µg/L) | Retained<br>as a<br>COC? |
|--|------|----------------------------|---------------------|----------------|-----------------------------|----------------------|------------------------|---------------|-----------------------|--------------------------|
| Methylene chloride                               | 1600 | 7,300,000                  | MW-2                | b              | 21,300                      | 06/24/16             | MW-2                   | 5             | —                     | Yes, 1                   |
| Trichloroethene                                  | 800  | 210,000                    | MW-2                | b              | 17,100                      | 06/16/16             | 120                    | 5             | —                     | Yes, 1                   |
| Perchlorate                                      | 750  | 69,000                     | 18WW17              | 2,500          | 82,900                      | 06/21/16             | 18WW17                 | —             | 17                    | Yes, 2                   |
| Chloroform                                       | 16   | 28                         | 95 UCL <sup>d</sup> | b              | 58.1                        | 06/24/16             | MW-2                   | —             | 240                   | No, 5                    |
| cis-1,2-Dichloroethene                           | 0.3  | 250                        | 95 UCL <sup>d</sup> | b              | 43,600                      | 06/24/16             | MW-2                   | 70            | —                     | Yes, 1                   |
| 1,4-Dioxane <sup>6</sup>                         | —    | 61.7                       | 95 UCL <sup>d</sup> | —              | 220                         | 06/16/16             | 120                    | —             | 9.1                   | Yes, 1                   |
| Antimony   | 8.1  | 333                        | 95 UCL <sup>d</sup> | b              | 1.49                        | 06/17/16             | MW-16                  | 6             | —                     | No, 5                    |
| Barium   | 0.84 | 6,000                      | MW-1                | b              | 10,300                      | 06/13/16             | 18CPTMW24              | 2,000         | —                     | Yes, 1                   |
| Chromium   | 0.12 | 18,000                     | MW-1                | b              | 4,620                       | 06/16/16             | 18WW16                 | 100           | —                     | Yes, 1                   |
| Manganese  | 1.7  | 8,270                      | MW-1                | 1.1            | 5,290                       | 06/29/16             | 18WW25                 | —             | 1,100*                | No, 7                    |
| Nickel   | 4.7  | 9,600                      | MW-1                | 7.0            | 14,300                      | 06/16/16             | 18WW16                 | —             | 490                   | Yes, 3                   |
| Silver   | 0.94 | 480                        | MW-1                | < 0.002        | < 1                         | June 2016            | All wells              | —             | 120                   | No, 4                    |
| Thallium   | 0.47 | 3.7                        | MW-2                | b              | 0.821                       | 06/17/16             | 109                    | 2             | —                     | No, 5                    |
| <b>Chemicals Retained on a Provisional Basis</b> |      |                            |                     |                |                             |                      |                        |               |                       |                          |
| Arsenic <sup>6</sup>                             | —    | —                          | —                   | —              | 16.1                        | 06/21/16<br>06/13/16 | 18CPTMW18<br>18CPTMW24 | 10            | —                     | Yes, 1                   |
| Cobalt   | 0.14 | 280                        | MW-1                | 0.178          | 355                         | 06/16/16             | 18WW16                 | —             | 240                   | Yes, 1                   |
| 1,3,5-Trinitrobenzene                            | 0.33 | 1,000                      | MW-2                | No Recent Data |                             |                      |                        | —             | 730                   | Yes, 3                   |

**Notes and Abbreviations:**

1. Identified as a COC since EPC and/or Recent Results are above the MCL or PCL.
2. Identified as COC since hazard quotient (HQ) is > 0.1 and EPC and recent results are above the TRRP PCL.
3. Retained as a COC since revised HQ > 0.1 and sum of HQs may exceed 1.0.
4. Excluded since Revised HQ < 0.1 using recent maximum concentration and chemical concentration is < PCL.
5. Excluded since Recent results are all less than the MCL or PCL, and pattern of detections does not indicate association with site contamination.
6. Included as contributing chemicals due to their frequency of detection above the MCL or PCL in recent sampling events (see Table 2-3).
7. Excluded because maximum concentrations of recent results are below the background 95%UTL.

- a. From Baseline Risk Assessment Table C-50 (Jacobs, 2002).
- b. Revised HQ not calculated for chemicals with an MCL or PCL.
- c. Using ProUCL for the results of samples collected in June 2016



**Table 2-8. Chemicals with Hazard Quotient Greater than 0.1 in Shallow Zone Groundwater (continued)**

Notes and Abbreviations: (cont'd.)

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

COC contaminant of concern

EPC exposure point concentration

HQ hazard quotient

MCL maximum contaminant level from the Safe Drinking Water Act

ND non detect

TRRP PCL Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level

UCL upper confidence limit

µg/L micrograms per liter

\* 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Groundwater Residential PCL thus the background value will be considered the Cleanup Level for Manganese.



**Table 2-9. Chemicals with Hazard Quotient Greater than 0.1 in Wilcox Formation Groundwater**

| Chemical   | SZ HQ <sup>a</sup> | SZ EPCz <sup>a</sup><br>(µg/L) | SZ Well             | Revised<br>Wilcox<br>Frmn HQ | Recent<br>Wilcox<br>Frmn<br>Maximum<br>(µg/L) | Date       | Well        | MCL<br>(µg/L) | TRRP<br>PCL<br>(µg/L) | Retained<br>as a<br>COC? |
|--|--------------------|--------------------------------|---------------------|------------------------------|---|------------|-------------|---------------|-----------------------|--------------------------|
| Methylene chloride                               | 1600               | 7,300,000                      | MW-2                | 0.16                         | 746   | 06/24/2016 | 18CPTMW01SW | 5             |                       | Yes, 1                   |
| Trichloroethene                                  | 800                | 210,000                        | MW-2                | 61                           | 15,900  | 06/07/2016 | MW-14B      | 5             |                       | Yes, 1                   |
| Perchlorate                                      | 750                | 69,000                         | 18WW17              | 2,490                        | 229,000                                       | 06/07/16   | MW-14B      |               | 17                    | Yes, 1                   |
| Chloroform                                       | 16                 | 28                             | 95 UCL              | 7.5                          | 13.2  | 06/07/16   | MW-14B      |               | 240                   | No, 5                    |
| cis-1,2-Dichloroethene                           | 0.3                | 250                            | 95 UCL              | 3.1                          | 2,600   | 06/07/16   | MW-14T      | 70            |                       | Yes, 1                   |
| 1,4-Dioxane <sup>6</sup>                         | —                  | 102.4                          | 95 UCL <sup>b</sup> | —                            | 412   | 06/07/16   | MW-14B      | —             | 9.1                   | Yes, 1                   |
| Antimony   | 8.1                | 333                            | 95 UCL <sup>b</sup> | <0.00002                     | <0.001  | June 2016  | All Wells   | 6             |                       | No, 4                    |
| Arsenic <sup>6</sup>                             | —                  | —                              | —                   | c                            | 17.3  | 06/24/16   | 18CPTMW01SW | 10            |                       | Yes, 1                   |
| Barium   | 0.84               | 6,000                          | MW-1                | 0.22                         | 1,560   | 06/14/14   | C-03        | 2,000         |                       | Yes, 3                   |
| Chromium   | 0.12               | 18,000                         | MW-1                | 0.000063                     | 9.5   | 06/14/16   | 18CPTMW04SW | 100           |                       | No, 4                    |
| Cobalt   | 0.14               | 280                            | MW-1                | 0.005                        | 9.64  | 06/24/16   | 18CPTMW12SW |               | 240                   | No, 4                    |
| Manganese  | 1.7                | 8,270                          | MW-1                | 0.38                         | 1,850   | 06/14/16   | C-03        |               | 1,100*                | No, 6                    |
| Nickel   | 4.7                | 9,600                          | MW-1                | 0.0036                       | 7.44 J  | 06/24/16   | 18CPTMW12SW |               | 490                   | No, 4                    |
| Silver   | 0.94               | 480                            | MW-1                | < 0.002                      | < 1   | June 2016  | All Wells   |               | 120                   | No, 4                    |
| Thallium   | 0.47               | 3.7                            | MW-2                | < 0.025                      | < 0.200                                       | June 2016  | All Wells   | 2             |                       | No, 4                    |
| <b>Chemicals Retained on a Provisional Basis</b> |                    |                                |                     |                              |   |            |             |               |                       |                          |
| 1,3,5-Trinitrobenzene                            | 0.33               | 1,000                          | MW-2                |                              | No Recent Data                                |            |             |               | 730                   | Yes, 2                   |

**Notes and Abbreviations:**

1. Identified as a COC since Recent Results are above the MCL or PCL.
2. Identified as COC since Shallow Zone hazard quotient (HQ) is > 0.1 and no recent data available.
3. Retained as a COC since Revised Wilcox Formation HQ > 0.1 and sum of HQs may exceed 1.0.
4. Excluded since Revised Wilcox Formation HQ < 0.1 using recent maximum concentration and chemical concentration is < PCL.
5. Excluded as a COC as maximum concentration in Wilcox Formation is below MCL/PCL., and pattern of detections does not indicate association with site contamination.
6. Excluded because maximum concentrations of recent results are below the background 95%UTL.

a. From Baseline Risk Assessment Table C-50 (Jacobs, 2002).

b. Using ProUCL for the results of samples collected in June 2016.



**Table 2-9. Chemicals with Hazard Quotient Greater than 0.1 in Wilcox Formation Groundwater (continued)**

Notes and Abbreviations: (cont'd.)

95 UCL indicates that the EPC was calculated rather than the maximum concentration at a specific well.

|          |  |
|----------|--|
| SZ       | shallow zone   |
| COC      | contaminant of concern   |
| EPC      | exposure point concentration   |
| HQ       | hazard quotient  |
| MCL      | maximum contaminant level from the Safe Drinking Water Act                                 |
| UCL      | upper confidence limit   |
| TRRP PCL | Texas Risk Reduction Program Tier 1 Residential Groundwater Protective Concentration Level |
| µg/L     | micrograms per liter   |
| B        | Sample collected from the bottom of well screen  |
| T        | Sample collected from top of well screen   |

\* 95% UTL value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007) for Manganese is 7,820 µg/L, which is above the TRRP Tier 1 Residential Groundwater PCL thus the background value will be considered the Cleanup Level for Manganese.

**Table 2-10. Cleanup Levels at LHAAP-18/24**

| Medium                              | Chemical of Concern             | Cleanup Level  |
|-------------------------------------|---------------------------------|--|
| <b>Shallow Zone Groundwater</b>     |                                 | <b>MCL (µg/L)</b>                                    |
|                                     | Methylene chloride              | 5  |
|                                     | Trichloroethylene               | 5  |
|                                     | cis-1,2-Dichloroethene*         | 70   |
|                                     | Tetrachloroethene               | 5  |
|                                     | Benzene                         | 5  |
|                                     | 1,1,2-Trichloroethane           | 5  |
|                                     | Vinyl chloride*                 | 2  |
|                                     | Arsenic                         | 10   |
|                                     | Barium                          | 2,000  |
|                                     | Chromium                        | 100  |
|                                     |                                 | <b>TRRP <sup>GW</sup>GW<sub>Ing</sub> PCL (µg/L)</b> |
|                                     | Bromodichloromethane            | 15   |
|                                     | 1,3,5-trinitrobenzene           | 730  |
|                                     | 1,4-Dioxane                     | 9.1  |
|                                     | Cobalt                          | 240  |
|                                     | Nickel                          | 490  |
|                                     | Perchlorate                     | 17   |
| <b>Wilcox Formation Groundwater</b> |                                 | <b>MCL (µg/L)</b>                                    |
|                                     | Methylene chloride              | 5  |
|                                     | Trichloroethylene               | 5  |
|                                     | cis-1,2-Dichloroethene*         | 70   |
|                                     | Tetrachloroethene               | 5  |
|                                     | Benzene                         | 5  |
|                                     | Vinyl chloride*                 | 2  |
|                                     | Arsenic                         | 10   |
|                                     | Barium                          | 2,000  |
|                                     |                                 | <b>TRRP <sup>GW</sup>GW<sub>Ing</sub> PCL (µg/L)</b> |
|                                     | Bromodichloromethane            | 15   |
|                                     | 1,3,5-trinitrobenzene           | 730  |
|                                     | 1,4-Dioxane                     | 9.1  |
|                                     | Perchlorate                     | 17   |
| <b>Soil</b>                         |                                 | <b>GWP-Ind (mg/kg)</b>                               |
|                                     | Methylene Chloride <sup>1</sup> | 0.5  |
|                                     | Trichloroethylene               | 0.5  |
|                                     | Perchlorate                     | 7.2  |
|                                     | Tetrachloroethene               | 0.5  |

**Notes:**

\* Trichloroethene daughter products

\*\*TRRP <sup>GW</sup>GW<sub>Ing</sub> PCL from April 2018, <https://www.tceq.texas.gov/remediation/trrp/trrppcls.html>

GWP-Ind MSC Texas Commission on Environmental Quality soil medium-specific concentration (MSC) for industrial use based on groundwater protection

µg/L micrograms per liter

MCL Safe Drinking Water Act (SDWA) maximum contaminant level

mg/kg milligrams per kilogram

MSC medium-specific concentration



Table 2-11. Comparative Analysis of Alternatives

| Criteria   | No Action   | Alternative 2<br>Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, LUC.   | Alternative 3<br>Containment, Groundwater Extraction and Treatment, MNA, LUC  | Alternative 4<br>Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Surfactant Flushing, LUC   | Alternative 5<br>Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Thermal Treatment, LUC  | Alternative 6<br>Enhanced Groundwater Extraction and Treatment, ISB Inside & Outside Containment and in Wilcox, Unsaturated Soil Excavation, Enhanced DNAPL Removal by Application of ZVI, LUC  |
|--|---|---|---|---|--|---|
| Overall protection of human health and the environment       | No protection. Does not achieve RAOs.   | Achieves RAOs but over a very long time. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.  | Achieves RAO for protecting human health by preventing exposure to contaminated groundwater. RAO for restoration of groundwater within the slurry wall area is not achieved within a reasonable time. Protection of human health and environment provided by physical containment of groundwater, and maintenance of LUC. MNA to treat areas outside slurry well and in Wilcox Formation. LTM to verify progress and containment. | Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.  | Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.   | Achieves RAOs. Protection of human health and environment provided by in situ bioremediation, ex situ groundwater treatment, DNAPL source removal, and maintenance of LUC. LTM to verify progress and hydraulic containment.  |
| Compliance with ARARs  | No compliance with chemical-specific ARARs.   | Complies with all ARARs.  | Will require an ARAR waiver for groundwater inside the slurry wall.   | Complies with all ARARs.  | Complies with all ARARs.   | Complies with all ARARs.  |
| Long-term effectiveness and permanence                       | Is not effective at protection of human health and the environment and does not provide permanence. | Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants though effectiveness is limited and progress slow. LUC would be effective and reliable so long as they are maintained and enforced.                             | Containment would be permanent and effective so long as the slurry wall and hydraulic control are maintained. LUC would be effective and reliable so long as they are maintained and enforced.  | Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants although small amounts of residual DNAPL would remain in low permeability zones. LUC would be effective and reliable so long as they are maintained and enforced. | Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants. LUC would be effective and reliable so long as they are maintained and enforced.                | Soil removal is a permanent remedy. In situ and ex situ groundwater treatment permanently removes or destroys contaminants. DNAPL source removal permanently removes contaminants although small amounts of residual DNAPL would remain in low permeability zones. LUC would be effective and reliable so long as they are maintained and enforced. |
| Reduction of toxicity, mobility, or volume through treatment | No reduction outside of natural processes.  | Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.   | Very limited reduction of toxicity and volume with no treatment of source areas. Reduced mobility within slurry wall.   | Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.   | Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.  | Reduced toxicity, mobility, and volume through in situ treatment, DNAPL and soil removal, and operating groundwater treatment system.   |
| Short-term effectiveness                                     | No short-term impacts.  | Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration several hundred years.   | Potential for impacts to the community through increased construction activity. Some potential for impacts to workers during construction of slurry wall. Outside slurry wall area COC removal estimated ≤ 20 years. Duration inside containment > 500 years.   | Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration 30+ years.   | Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration ≤ 20 years. | Greater potential for impacts to the community or LHAAP workers through off-site transportation of excavated soil. Release to environment can be controlled during construction. Some potential for impacts to workers during in situ treatment applications. Duration ≤ 30 years.  |
| Implementability   | Technically implementable; administratively unacceptable.   | Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Extraction and treatment of groundwater is already implemented at the site. The effectiveness of extraction on DNAPL source removal is limited and controlled by the dissolution rate of DNAPL. | Implementable, but uncertainty exists in the effectiveness of slurry wall containment. Uncertain overall duration and cleanup levels possibly not attainable inside slurry wall.  | Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Injection of surfactants uses similar tools as in situ bioremediation. Dual phase extraction is an established technology.  | Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Thermal treatment is a commercially available technology but planning well in advance is required.                               | Soil excavation readily implemented with standard earthmoving equipment. In situ bioremediation is a commercially available treatment technology. Injection of ZVI uses similar tools as in situ bioremediation.  |
| *Costs   |   |   |   |   |  |   |
| Capital  | \$0   | \$10,600,000  | \$6,410,000   | \$13,110,000  | \$19,520,000   | \$102,230,000   |
| O&M  | \$0   | \$19,600,000  | \$12,240,000  | \$19,390,000  | \$13,150,000   | \$19,390,000  |
| Total  | \$0   | \$30,200,000  | \$18,650,000  | \$32,500,000  | \$32,670,000   | \$121,620,000   |
| State Acceptance   | This criterion will be evaluated in the Proposed Plan after state agency comments are provided      |   |   |   |  |   |
| Community Acceptance   | This criterion will be evaluated in the Proposed Plan after community comments are provided         |   |   |   |  |   |



**Table 2-12. Remediation Cost Table Selected Remedy (Alternative 5) Present Worth Analysis**

| Year | Capital Costs                             | O&M Costs          |                     |                  |                     | Present Value (NPV)           |              |
|------|---|--------------------|---------------------|------------------|---------------------|-------------------------------|--------------|
|      |   | Monitoring         | GWTP                | 5-Yr Review      | Total               | Discount Rate Capital<br>3.0% | O&M          |
|      | Fees, Workplan, Documentation, Reactivate |                    |                     |                  |                     |                               |              |
|      | ICT 3 and 9, Soil Excavation, New GWTP,   |                    |                     |                  |                     |                               |              |
| 1    | \$17,441,249 ERH, EISB - 1st Event        | \$646,751          | \$534,987           |                  | \$1,181,738         | NPV \$19,520,000              | \$13,150,000 |
| 2    |   | \$646,751          | \$551,037           |                  | \$1,197,787         | Total Capital and O&M         | \$32,670,000 |
| 3    | \$1,768,144 EISB - 2nd event              | \$323,084          | \$567,568           |                  | \$890,652           |                               |              |
| 4    |   | \$323,084          | \$584,595           |                  | \$907,679           |                               |              |
| 5    |   | \$323,084          | \$602,133           | \$40,983         | \$966,200           |                               |              |
| 6    |   | \$166,045          | \$620,197           |                  | \$786,242           |                               |              |
| 7    |   | \$166,045          | \$638,803           |                  | \$804,848           |                               |              |
| 8    |   | \$166,045          | \$657,967           |                  | \$824,012           |                               |              |
| 9    |   | \$166,045          | \$677,706           |                  | \$843,751           |                               |              |
| 10   | \$326,379 Major Equipment Replacement     | \$166,045          | \$698,037           | \$40,983         | \$905,065           |                               |              |
| 11   |   |                    | \$575,183           |                  | \$575,183           |                               |              |
| 12   |   | \$166,045          | \$592,438           |                  | \$758,483           |                               |              |
| 13   |   |                    | \$610,211           |                  | \$610,211           |                               |              |
| 14   |   | \$166,045          | \$628,517           |                  | \$794,562           |                               |              |
| 15   | \$336,171 Major Equipment Replacement     |                    | \$647,373           | \$40,983         | \$688,356           |                               |              |
| 16   |   | \$166,045          | \$666,794           |                  | \$832,839           |                               |              |
| 17   |   |                    | \$686,798           |                  | \$686,798           |                               |              |
| 18   |   | \$166,045          | \$707,402           |                  | \$873,447           |                               |              |
| 19   |   |                    | \$728,624           |                  | \$728,624           |                               |              |
| 20   |   | \$166,045          | \$750,483           | \$40,983         | \$957,511           |                               |              |
| 21   |   |                    |                     |                  | \$0                 |                               |              |
| 22   |   | \$166,045          |                     |                  | \$166,045           |                               |              |
| 23   |   |                    |                     |                  | \$0                 |                               |              |
| 24   |   | \$166,045          |                     |                  | \$166,045           |                               |              |
| 25   |   |                    |                     | \$32,787         | \$32,787            |                               |              |
| 26   |   | \$166,045          |                     |                  | \$166,045           |                               |              |
| 27   |   |                    |                     |                  | \$0                 |                               |              |
| 28   |   | \$166,045          |                     |                  | \$166,045           |                               |              |
| 29   |   |                    |                     |                  | \$0                 |                               |              |
| 30   |   | \$166,045          |                     | \$32,787         | \$198,832           |                               |              |
|      | <b>\$19,871,943</b>                       | <b>\$4,753,426</b> | <b>\$12,726,853</b> | <b>\$229,507</b> | <b>\$17,709,787</b> |                               |              |



**Table 2-13. Description of ARARs for Selected Remedy**

| Citation   | Activity or Prerequisite/Status   | Requirement  |
|--|---|--|
| <b>Soil</b>  |   |  |
| <b>TCEQ Texas Risk Reduction Rules</b><br><br>30 TAC 335.558 and 335.559(g)(2)           | Ensures adequate protection of human health and the environment from potential exposure to contaminants associated with releases – <b>relevant and appropriate</b> 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 <b>Table 2-10</b> for specific numeric criteria.   |
| <b>Groundwater</b>   |   |  |
| <b>Federal Safe Drinking Water Act (SDWA) MCLs</b><br><br>40 C.F.R. §§ 141.61 and 141.62 | Applicable to drinking water for a public water system— <b>relevant and appropriate</b> for water that could potentially be used for human consumption.   | Must not exceed SDWA MCLs for water designated as a current or potential source of drinking water. The MCLs for organic contaminants MC, TCE, PCE, cis-1,2-DCE, benzene, 1,1,2-TCA and VC are provided in 40 C.F.R. § 141.61(a) and the MCLs for inorganic contaminants arsenic, barium and chromium are provided in 40 C.F.R. § 141.62 (b) and <b>Table 2-10</b> of this report.  |
| <b>Surface Water</b>   |   |  |
| <b>Texas Surface Water Quality Criteria</b><br>(30 TAC §307.6(d)(1))                     | Applicable to chemicals in surface water (Harrison Bayou) for water that could potentially be used for human consumption.   | Chemicals must not exceed the Texas surface water quality standards in waters of the Harrison Bayou. The surface water quality standards for MC, TCE, PCE, Benzene, 1,1,2-TCA and VC are provided in 30 TAC §307.6(d)(1).  |
| <b>Texas Surface Water Quality Criteria</b><br>(30 TAC §307.6(d)(1))                     | Applicable to industrial groundwater— <b>relevant and appropriate</b> to meet Texas surface water quality criteria  | Interim Record of Decision effluent discharge limits. The discharge criteria ( <b>Table 2-14</b> ) for the COCs will be re-evaluated based on most current TCEQ standards  |
| <b>General Site Preparation, Construction, and Excavation Activities</b>                 |   |  |
| <b>Opacity Standard</b><br><br>30 TAC 111.111(a)(8)(A)                                   | Fugitive emissions from land-disturbing activities (e.g., excavation, construction)— <b>applicable</b> .  | Visible emissions shall not be permitted to exceed opacity of 30% for any 6-minute period from any source.   |
| <b>Fugitive Particulate Matter Standard</b><br><br>30 TAC 111.145                        | Fugitive emissions from land-disturbing activities (e.g., excavation, construction)— <b>applicable</b> .  | 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: <ul style="list-style-type: none"> <li>• 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</li> <li>• Use of adequate methods to prevent airborne particulate matter during sandblasting of structures or similar operations</li> </ul> |





| <b>Table 2-13. Description of ARARs for Selected Remedy (continued)</b>   |  |   |
|---|--|---|
| <b>Citation</b>   | <b>Activity or Prerequisite/Status</b>   | <b>Requirement</b>  |
| <b>Storm Water Runoff Controls</b><br><br>40 C.F.R. § 122.26  | Storm water discharges associated with construction activities— <b>applicable</b> 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.   |
| <b>Air Contaminants – General Nuisance Rules</b><br><br>30 TAC 101.4  | Emissions of air contaminants— <b>applicable</b> .   | 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.   |
| <b>Waste Generation, Management, and Storage</b>  |  |   |
| <b>Characterization of Solid Waste</b><br><br>40 C.F.R. § 262.11<br>30 TAC 335.62<br>30 TAC 335.504<br>30 TAC 335.503(a)(4)                               | Generation of solid waste, as defined in 30 TAC 335.1— <b>applicable</b> .   | <p>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 C.F.R. § 262–268.</p> <p>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.</p> |
| <b>Requirements for Temporary Storage of Hazardous Waste in Accumulation Areas</b><br><br>40 C.F.R. § 262.34(a) and (c)(1)<br>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— <b>applicable</b> if hazardous waste is generated (e.g., PPE) and stored in an accumulation area. | <p>Remedial activities derived waste (from monitoring and treating contaminated groundwater) is expected for this facility. A generator may accumulate hazardous waste at the facility provided that</p> <ul style="list-style-type: none"> <li>• Waste is placed in containers that comply with 40 C.F.R. § 264.171 to 264.173 (Subpart I); and</li> <li>• Container is marked with the words “hazardous waste”; or</li> <li>• Container may be marked with other words that identify the contents.</li> </ul>   |
| <b>Characterization of Hazardous Waste</b><br><br>40 C.F.R. § 264.13(a)(1);<br>40 C.F.R. § 268.7<br>30 TAC 335.504(3)<br>30 TAC 335.509<br>30 TAC 335.511 | Generation of a RCRA hazardous waste for treatment, storage, or disposal— <b>applicable if hazardous waste is generated</b> (e.g., PPE).   | <p>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 C.F.R. § 264 and 268.</p> <p>Must also determine whether the waste is restricted from land disposal under 40 C.F.R. § 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.</p>   |



| <b>Table 2-13. Description of ARARs for Selected Remedy (continued)</b>  |  |   |
|--|--|---|
| <b>Citation</b>  | <b>Activity or Prerequisite/Status</b>   | <b>Requirement</b>  |
| <b>Requirements for the Use and Management of Containers</b><br><br>40 C.F.R. § 264.171–264.173<br>30 TAC 335.69(e)<br>30 TAC 335.152(a)(7)                        | On-site storage/treatment of RCRA hazardous waste in containers for greater than 90 days— <b>applicable</b> if hazardous waste is generated (e.g., PPE) and is stored in containers. | Design and operating standards of 40 C.F.R. § 264.175(c) and 40 C.F.R. § 264.171, 264.172, and 264.173(a) and (b) must be met for the use and management of hazardous waste in containers.  |
| <b>Well Construction</b>   |  |   |
| <b>Well Construction Standards—Monitoring or Injection Wells</b><br><br>16 TAC 76.1000   | Construction of water wells— <b>applicable to construction of new monitoring or injection wells, if needed.</b>  | Injection wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate. <b>Substantive requirements applicable to the injection wells will be adhered to.</b>  |
| <b>Well Construction Standards—Extraction Wells</b><br><br>16 TAC 76.1000(a) and (c) through (h)<br>16 TAC 76.1002(a) through (c)<br>16 TAC 76.1008(a) through (c) | Construction of water wells— <b>applicable</b> to construction of extraction (recovery) wells.   | Substantive requirements applicable to extraction (recovery) wells will be adhered to. Wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate.<br><br>Water wells completed to produce undesirable water shall be cased to prevent the mixing of water or constituent zones.<br><br>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.<br><br>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.<br><br>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. |



| <b>Table 2-13. Description of ARARs for Selected Remedy (continued)</b>  |   |   |
|--|---|---|
| <b>Citation</b>  | <b>Activity or Prerequisite/Status</b>  | <b>Requirement</b>  |
| <b>Treatment/Disposal</b>  |   |   |
| <b>Disposal of Wastewater</b><br>(e.g., contaminated groundwater, dewatering fluids, decontamination liquids)<br><br>40 C.F.R. § 268.1(c)(4)(i)<br>30 TAC 335.431(c) | RCRA-restricted characteristically hazardous waste intended for disposal— <b>applicable if extracted groundwater is determined to be RCRA characteristically hazardous.</b> | 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.   |
| <b>Closure</b>   |   |   |
| <b>Standards for Plugging Wells that Penetrate Undesirable Water or Constituent Zones</b><br>16 TAC 76.1004(a) through (c)   | Plugging and abandonment of wells— <b>applicable to plugging and closure of monitoring and/or extraction wells.</b>   | 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. |
| <b>Post Closure Care Requirements for Hazardous Waste Landfills</b><br>40 CFR § 264.228(b)(1)(3)(4)<br>30 TAC § 335.174(b)<br>40 CFR §§ 264.117 - 264.120            | Closure of a RCRA landfill – <b>relevant and appropriate</b> to closure or post closure under CERCLA of surface impoundments containing RCRA hazardous waste                | Owner or operator must <ul style="list-style-type: none"> <li>• Maintain the effectiveness and integrity of the final cover including making repairs to the cap as necessary to correct effects of settling, erosion, etc.;</li> <li>• Prevent run-on and runoff from eroding or otherwise damaging final cover; and</li> <li>• Maintain and monitor a groundwater monitoring system.</li> </ul>  |

**Abbreviations:**

|        |   |
|--------|---|
| ARAR   | applicable or relevant and appropriate requirement                            |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| CFR    | Code of Federal Regulations   |
| CWA    | Clean Water Act of 1972   |
| GWP    | Groundwater Protection  |
| MCL    | Maximum Contaminant Level   |
| lb/gal | pound per gallon  |
| %      | percent   |
| PCL    | Texas Residential Groundwater Protective Concentration Level                  |
| PPE    | personal protective equipment   |
| ppm    | part per million  |
| RCRA   | Resource Conservation and Recovery Act of 1976                                |
| TAC    | Texas Administrative Code   |
| TCEQ   | Texas Commission on Environmental Quality                                     |
| USC    | United States Code  |
| USEPA  | U.S. Environmental Protection Agency  |

Table 2-14. Current Effluent Limitations for the Discharge of Remediated Groundwater from the Groundwater Treatment Plant

| Chemical                             | Units are (µg/L)            |                             |                 |
|--------------------------------------|-----------------------------|-----------------------------|-----------------|
|                                      | Daily Average Concentration | Daily Maximum Concentration | Reporting Limit |
| VOCs                                 |                             |                             |                 |
| 1,1,1-Trichloroethane                | 3,417                       | 7,230                       | 1               |
| 1,1,2-Trichloroethane                | 102.5                       | 216.9                       | 1               |
| 1,1-Dichloroethane                   | 6,633                       | 14,032                      | 1               |
| 1,1-Dichloroethene                   | 119                         | 253                         | 1               |
| 1,2-Dichloroethane                   | 85                          | 181                         | 1               |
| Acetone                              | 1,132                       | 2,395                       | 2               |
| Benzene                              | 85                          | 181                         | 1               |
| Carbon tetrachloride                 | 85                          | 181                         | 1               |
| Chlorobenzene                        | 22,300                      | 47,180                      | 1               |
| Chloroform                           | 1,708                       | 3,615                       | 1               |
| Ethylbenzene                         | 26,954                      | 57,025                      | 1               |
| m,p-xylenes                          | 39.5                        | 83.6                        | 2               |
| Methylene chloride (dichloromethane) | 803                         | 1,699                       | 2               |
| o-xylene                             | 39.5                        | 83.6                        | 1               |
| Styrene                              | 2,829                       | 5,987                       | 1               |
| Tetrachloroethene                    | 85.4                        | 180.7                       | 1               |
| Toluene                              | 1,980                       | 4,189                       | 1               |
| Trichloroethene                      | 85                          | 181                         | 1               |
| Vinyl chloride                       | 34                          | 72                          | 1               |
| Metals                               |                             |                             |                 |
| Barium (total)                       | 1,000                       | 2,000                       | 4               |
| Chromium (6+)                        | 58                          | 124                         | 10              |
| Lead (total)                         | 2.2                         | 4.6                         | 2               |
| Selenium (total)                     | 5.7                         | 12                          | 2               |
| Silver                               | 1.4                         | 3                           | 2               |
| Perchlorate                          |                             |                             |                 |
| Perchlorate                          | 278                         | 589                         | 4               |
| SVOCs                                |                             |                             |                 |
| 1,4-Dioxane                          | NA                          | 134.2                       | 1               |

Table 2-14. Current Effluent Limitations for the Discharge of Remediated Groundwater from the Groundwater Treatment Plant (continued)

| Chemical | Units are (µg/L)            |                             |                 |
|----------|-----------------------------|-----------------------------|-----------------|
|          | Daily Average Concentration | Daily Maximum Concentration | Reporting Limit |
| Anions   |                             |                             |                 |
| Chloride | NA                          | N/A                         | 10,000          |
| Sulfate  | NA                          | N/A                         | 10,000          |

Notes:  
Daily average concentration – the arithmetic average of all effluent samples, composite or grab as required by this permit within a period of one calendar month, consisting of at least four separate representative measurements. When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values taken during the month shall be utilized as the daily average concentration.  
Daily maximum concentration – the maximum concentration measured on a single day, by composite sample, unless otherwise specified elsewhere in the permit.  
TAC reference – most of the limitations are based upon water quality standards found at TAC 307 for the protection of human health and aquatic life. The limit for barium is from TAC 319 – Subchapter B.  
Reporting limit - the minimum analytical level. All testing must be completed utilizing USEPA approved methods which can detect the pollutant to the referenced concentration.  
N/A – not applicable.

The allowable flow rate of GWTP effluent that can be discharged to Harrison Bayou is given by:

$$Q_E = \frac{C_C(Q_E + Q_S) - Q_S C_A}{C_E}$$

- where
- Q<sub>E</sub> = GWTP effluent flow

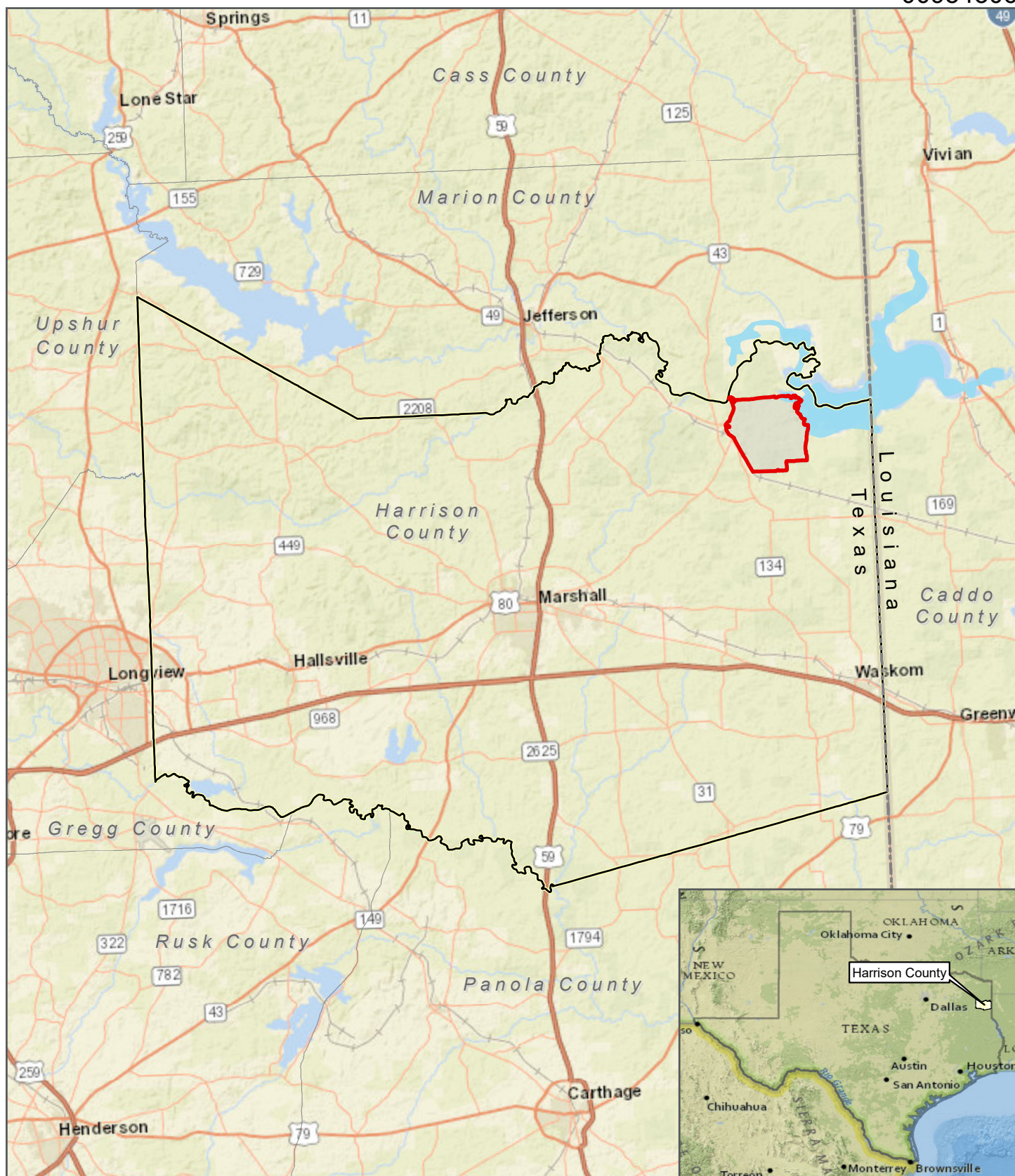
Q<sub>S</sub> = Harrison Bayou flow

C<sub>C</sub> = Criteria concentration (100 mg/L for chloride, 50 mg/L for sulfate)

C<sub>A</sub> = Ambient concentration = 10 mg/L

C<sub>E</sub> = Chloride or sulfate concentration in GWTP effluent





## LEGEND

- LHAAP Installation Boundary
- Harrison County
- State Boundary

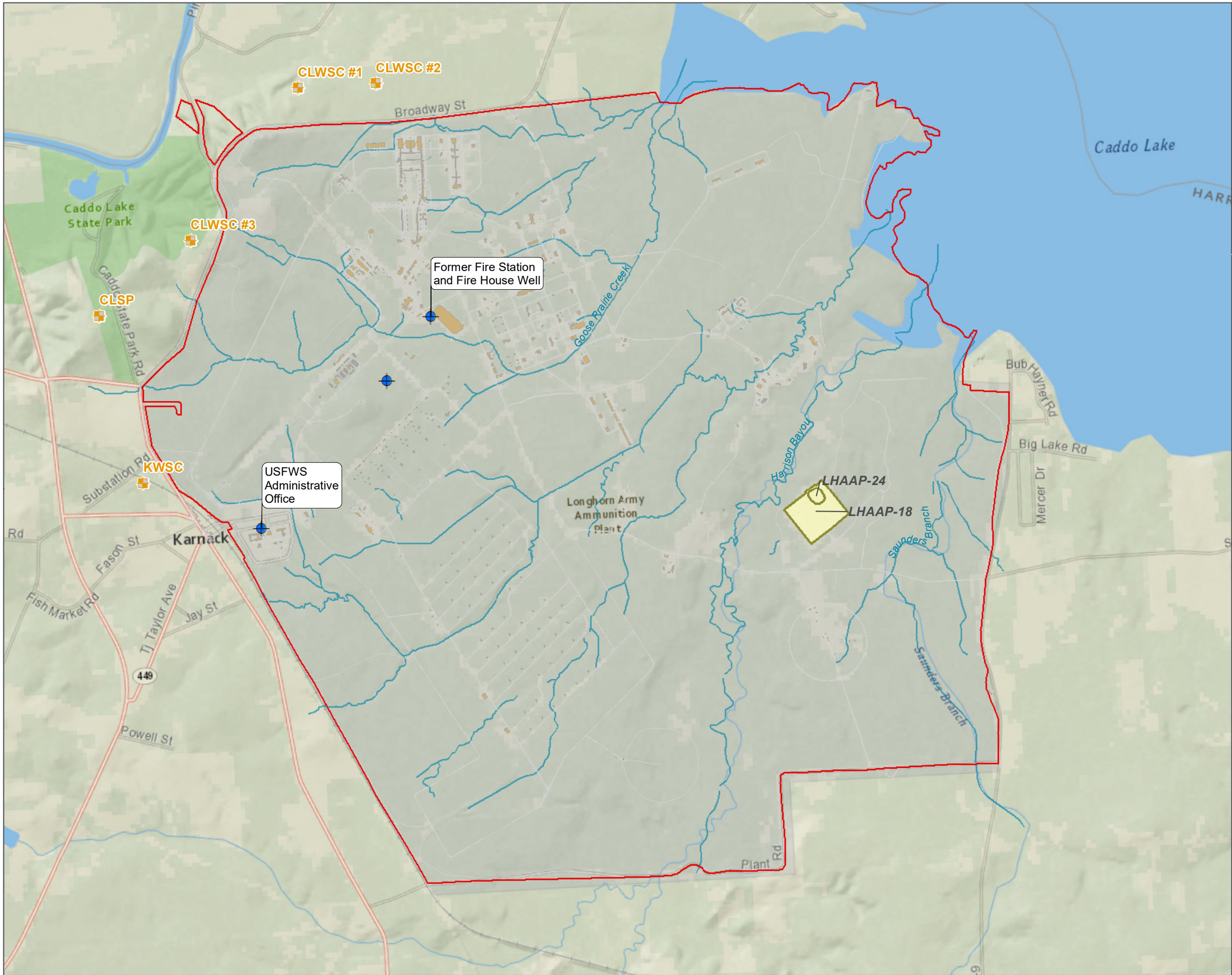
**SITE LOCATION**  
 LONGHORN ARMY  
 AMMUNITION PLANT  
 KARNACK, TEXAS

DATA SOURCES: AECOM, ESRI, LHAAP

DISCLAIMER: Map information was compiled from the best available sources.  
 No warranty is made for its accuracy or completeness.

FIGURE 2-1





- LEGEND
- Public Water Supply Well Locations
  - Potable Water Wells
  - Roads
  - Building
  - Site
  - LHAAP Installation Boundary

CLWSC – Caddo Lake Water Supply Corporation  
KWSC – Karnack Water Supply Corporation

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**SITE VICINTY**  
**LONGHORN ARMY AMMUNITION PLANT**  
**KARNACK, TEXAS**

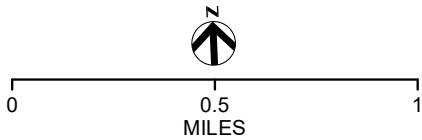
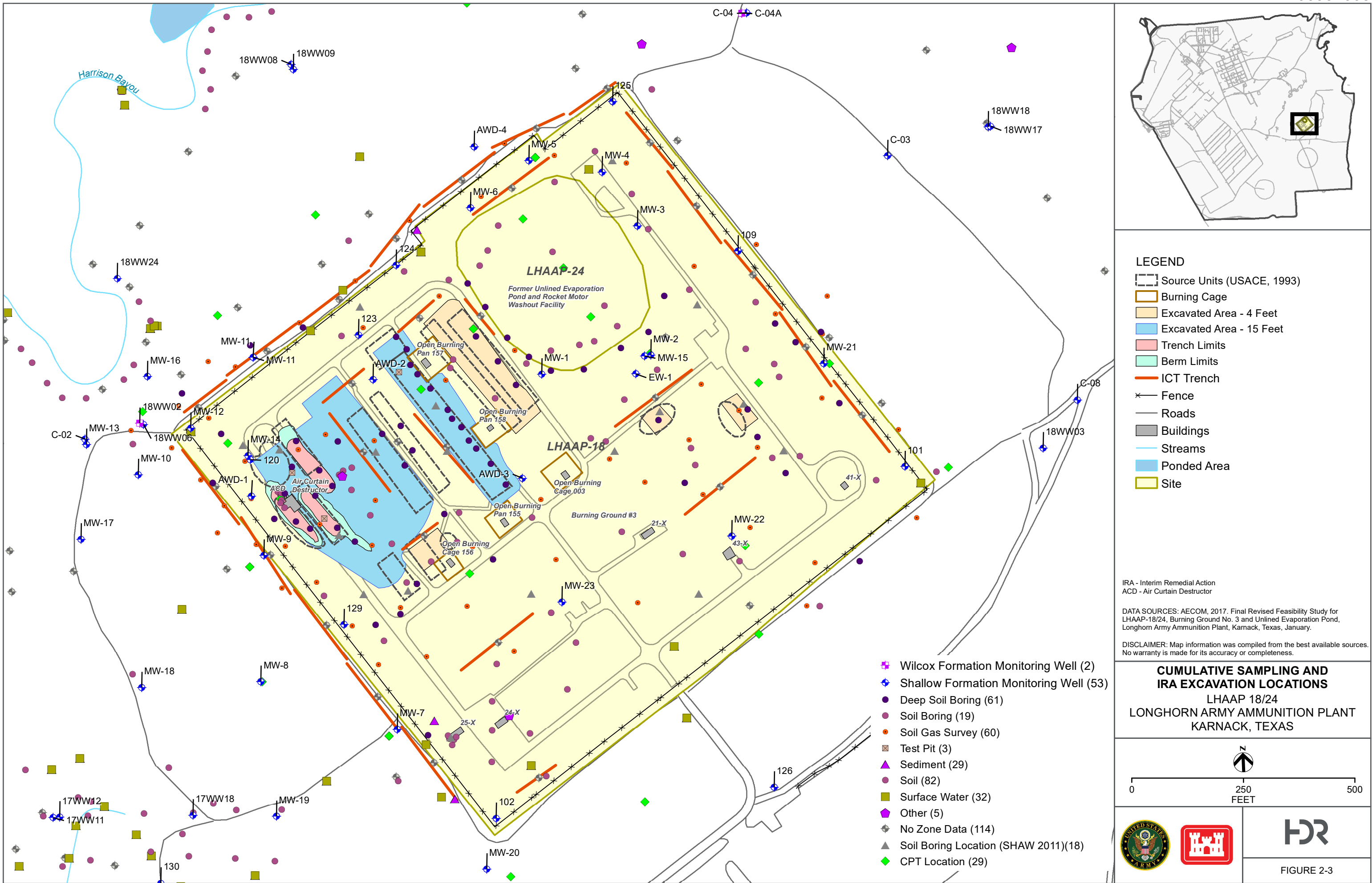
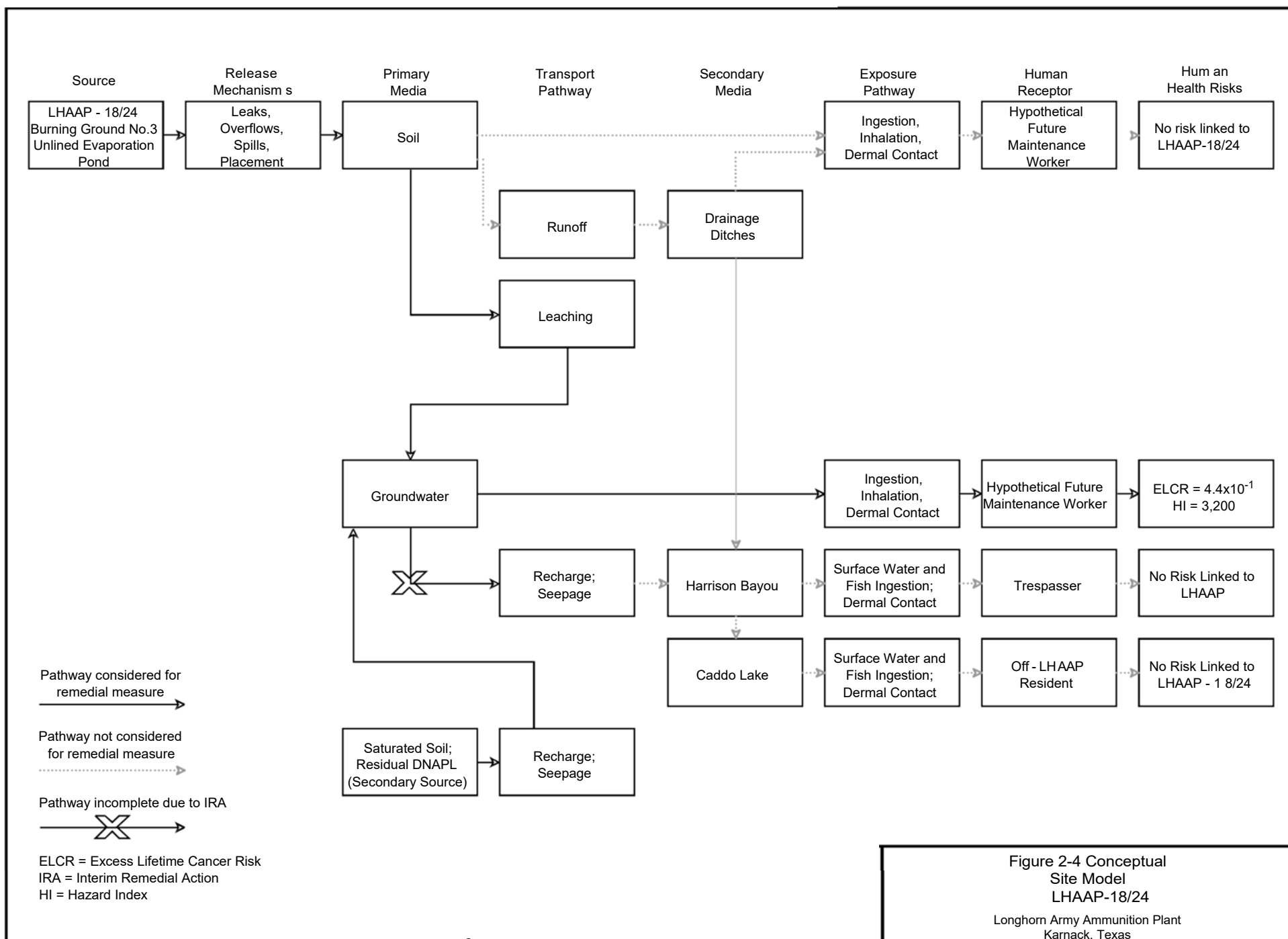


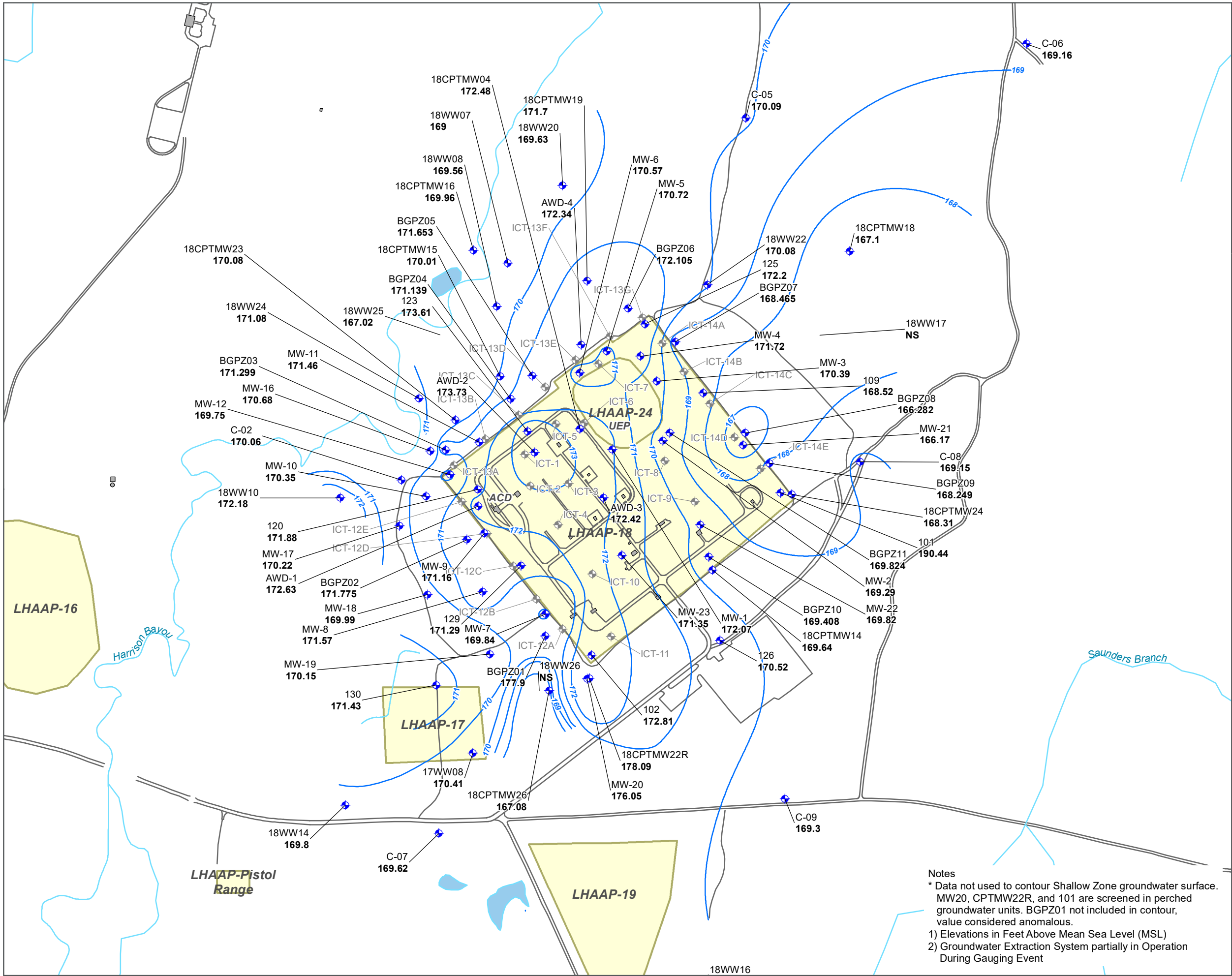
FIGURE 2-2











**LEGEND**

- Shallow Zone Monitoring Well
- ICT Extraction Location
- Groundwater Contour (dashed where inferred)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**GROUNDWATER POTENTIOMETRIC  
SHALLOW ZONE (JUNE 2016)**

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

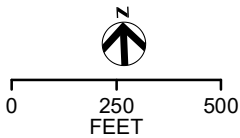
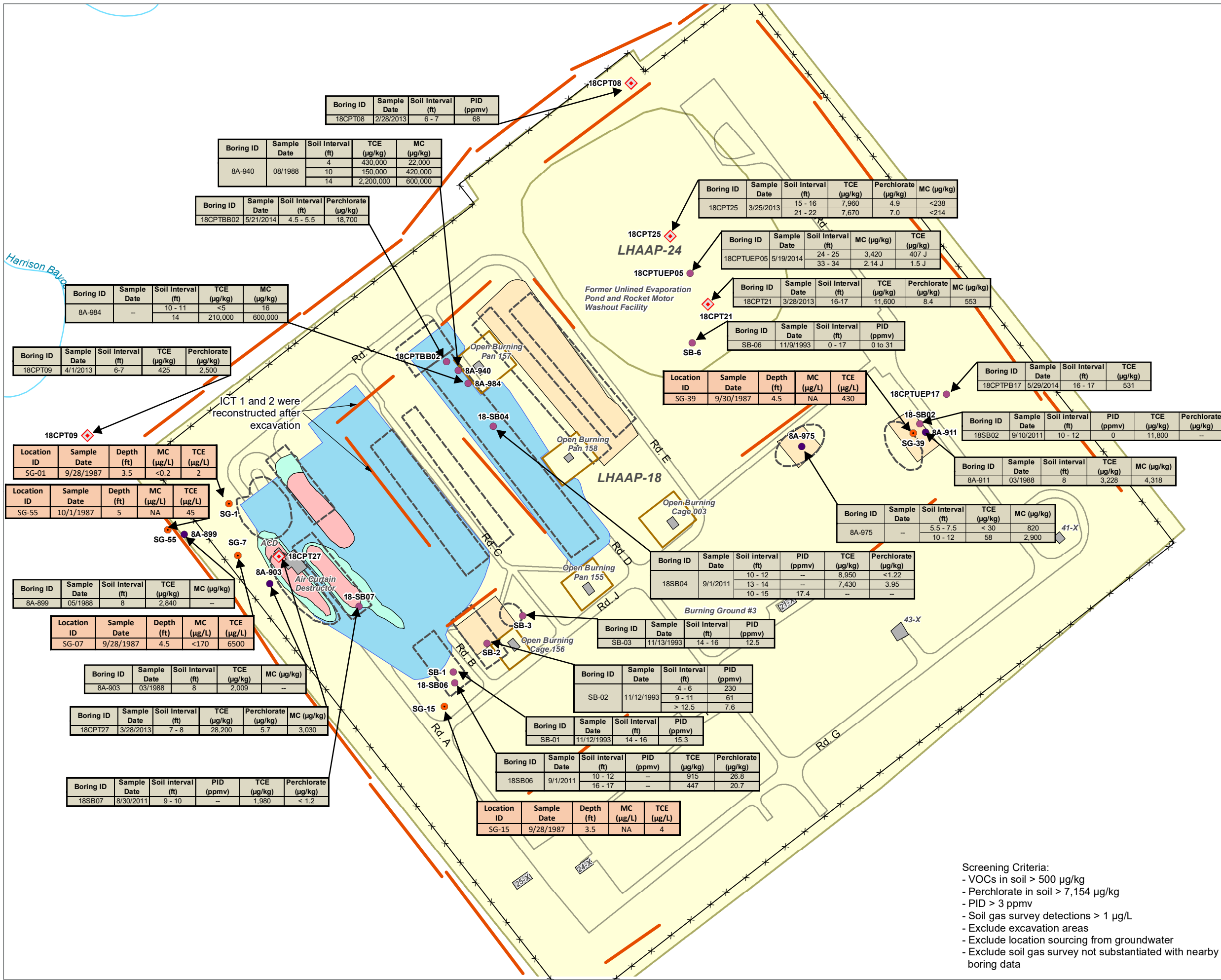


FIGURE 2-5







- LEGEND**
- Site
  - Source Units (USACE, 1993)
  - Burning Cage
  - Excavated Area - 4 Feet
  - Excavated Area - 15 Feet
  - Trench Limits
  - Berm Limits
  - Soil Boring
  - Deep Soil Boring
  - Soil Gas Survey
  - Test Pit
  - CPT/MIP Location (AECOM, 2013)
  - ICT Trench
  - Fence

**Soil Result**

| Boring ID | Sample Date | Soil Interval (ft) | PID (ppmv) |
|-----------|-------------|--------------------|------------|
| 18CPT08   | 2/28/2013   | 6 - 7              | 68         |

**Soil Gas Result**

| Location ID | Depth (ft) | MC (µg/L) | TCE (µg/L) |
|-------------|------------|-----------|------------|
| SG-15       | 3.5        | NA        | 4          |

ACD – Air Curtain Destructor

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**RESULTS OF RECENT SOIL SAMPLING**

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

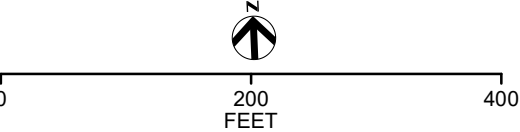
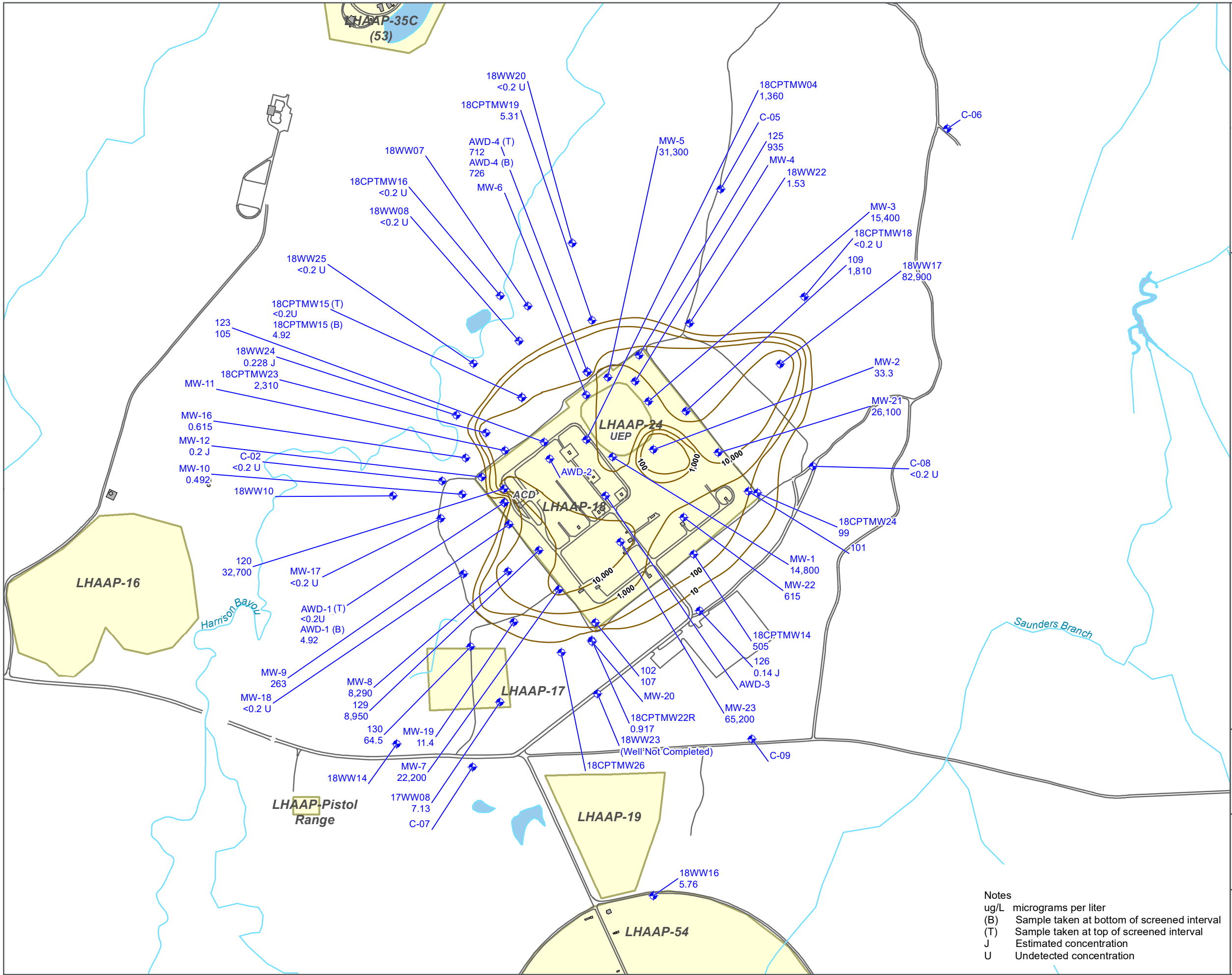


FIGURE 2-7

- Screening Criteria:
- VOCs in soil > 500 µg/kg
  - Perchlorate in soil > 7,154 µg/kg
  - PID > 3 ppmv
  - Soil gas survey detections > 1 µg/L
  - Exclude excavation areas
  - Exclude location sourcing from groundwater
  - Exclude soil gas survey not substantiated with nearby boring data



**LEGEND**

- Shallow Zone Monitoring Well with Well ID and Perchlorate Concentration in ug/L
- Perchlorate Contour (ug/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**PERCHLORATE ISOPLETH CONTOURS  
IN SHALLOW ZONE (JUNE 2016)**

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

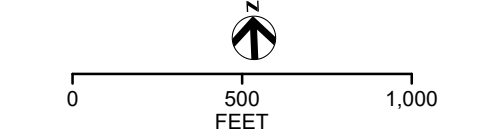
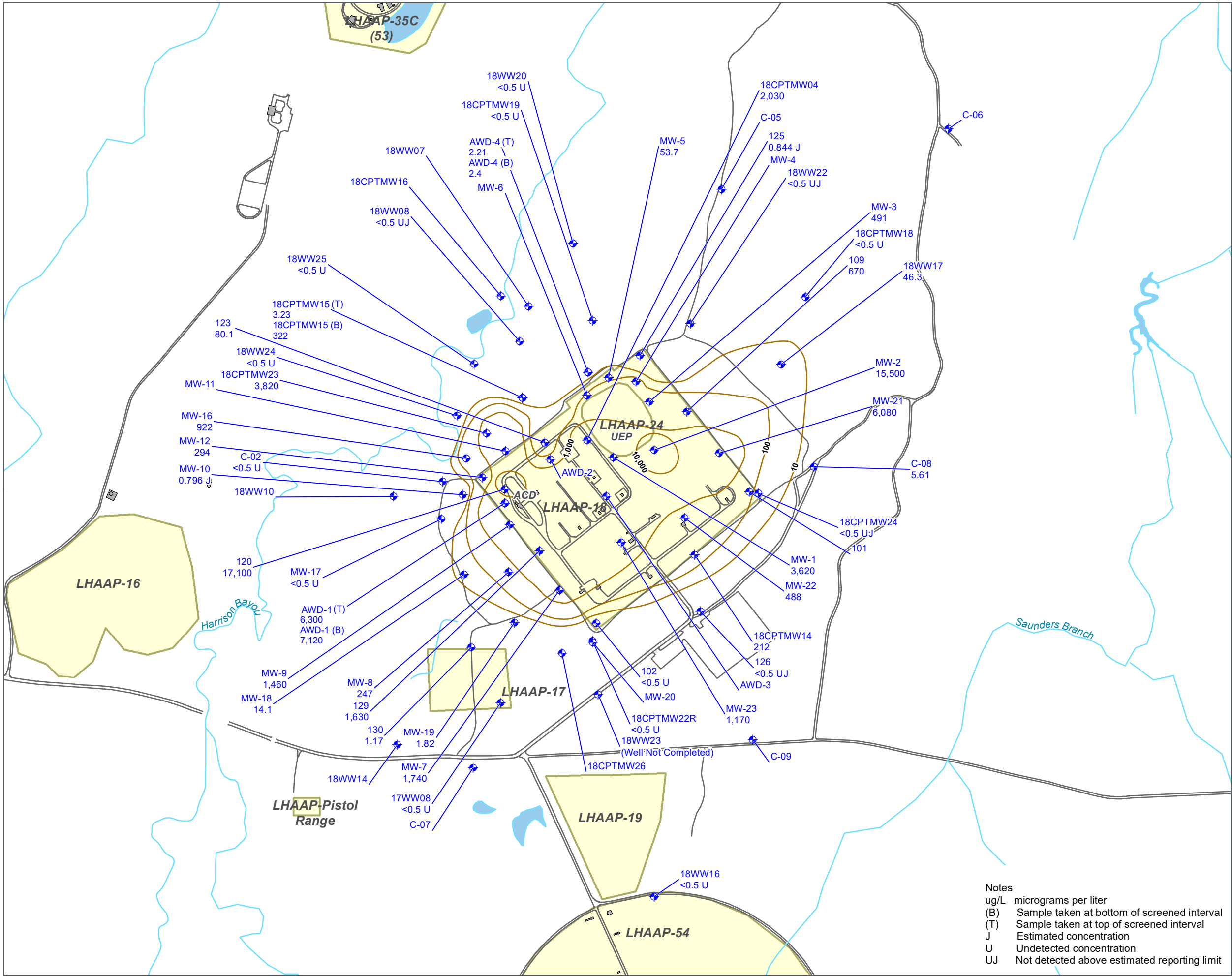


FIGURE 2-8





LEGEND

- Shallow Zone Monitoring Well with Well ID and Trichloroethene Concentration in ug/L
- Trichloroethene Contour ( $\mu\text{g/L}$ )
- Streams
- Ponded Area
- Roads
- Buildings
- Site

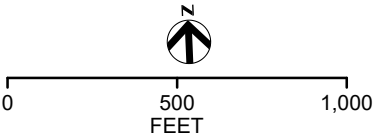
ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

TRICHLOROETHENE ISOPLETH CONTOURS  
IN SHALLOW ZONE (JUNE 2016)

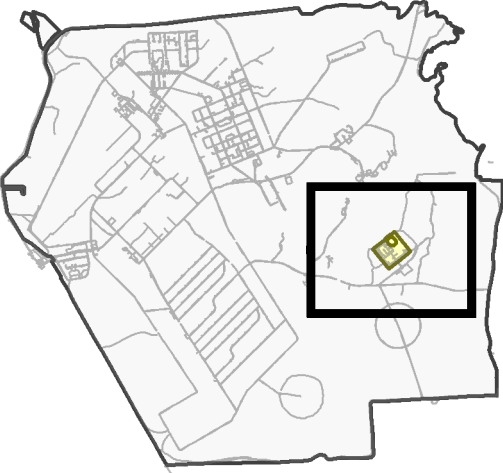
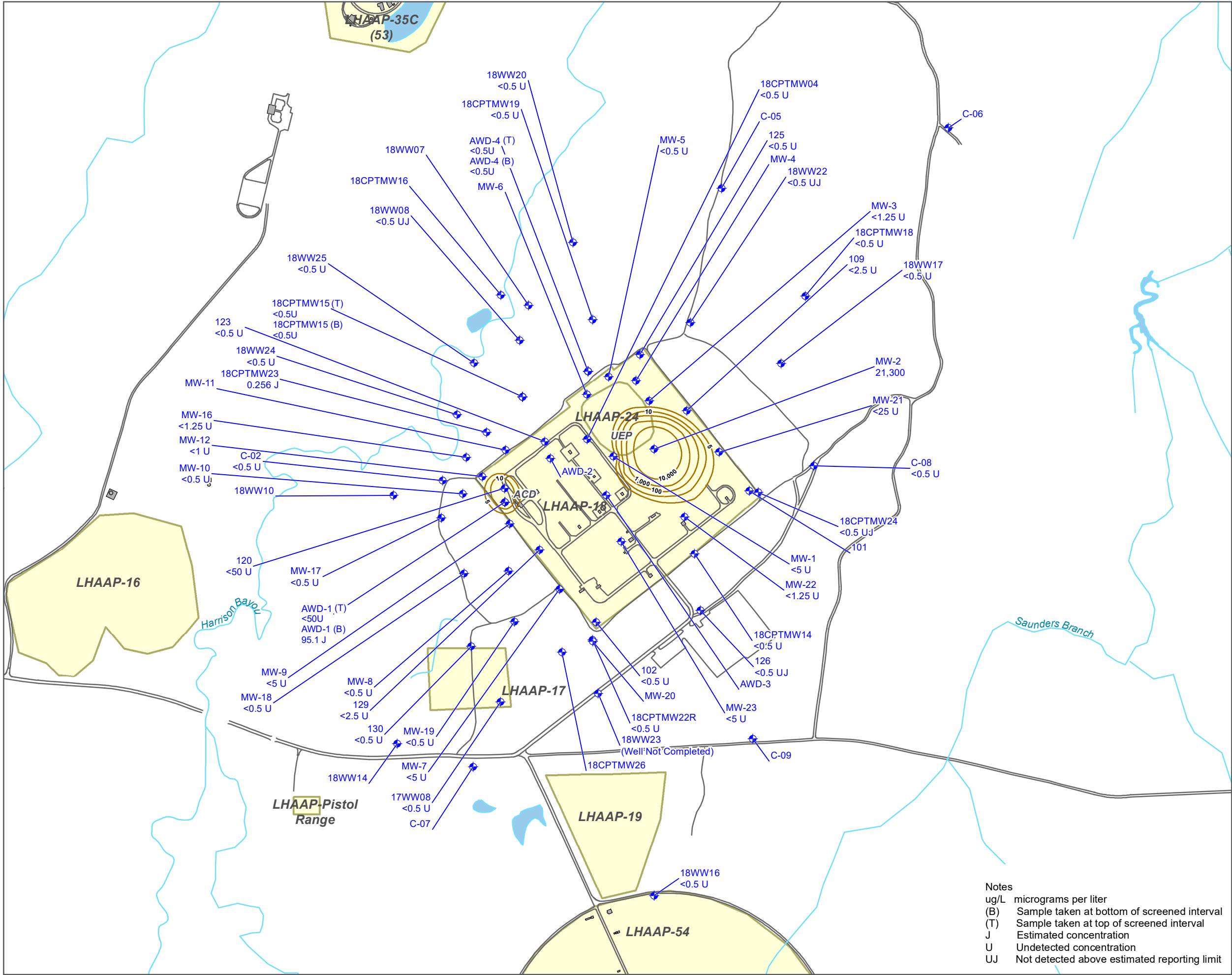
LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS



- Notes
- ug/L micrograms per liter
  - (B) Sample taken at bottom of screened interval
  - (T) Sample taken at top of screened interval
  - J Estimated concentration
  - U Undetected concentration
  - UJ Not detected above estimated reporting limit



FIGURE 2-9



- LEGEND**
- Shallow Zone Monitoring Well with Well ID and Methylene Chloride Concentration in ug/L
  - Methylene Chloride Contour (µg/L)
  - Streams
  - Ponded Area
  - Roads
  - Buildings
  - Site

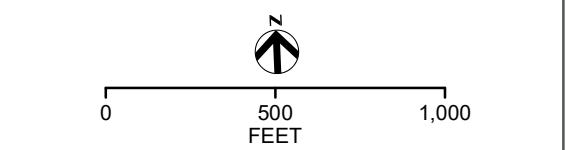
ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**METHYLENE CHLORIDE ISOPLETH  
CONTOURS IN SHALLOW ZONE (JUNE 2016)**

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS






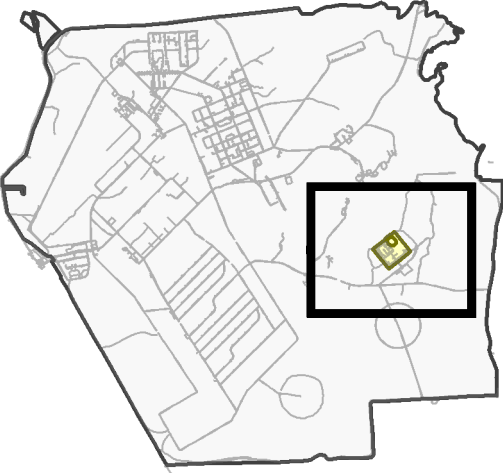
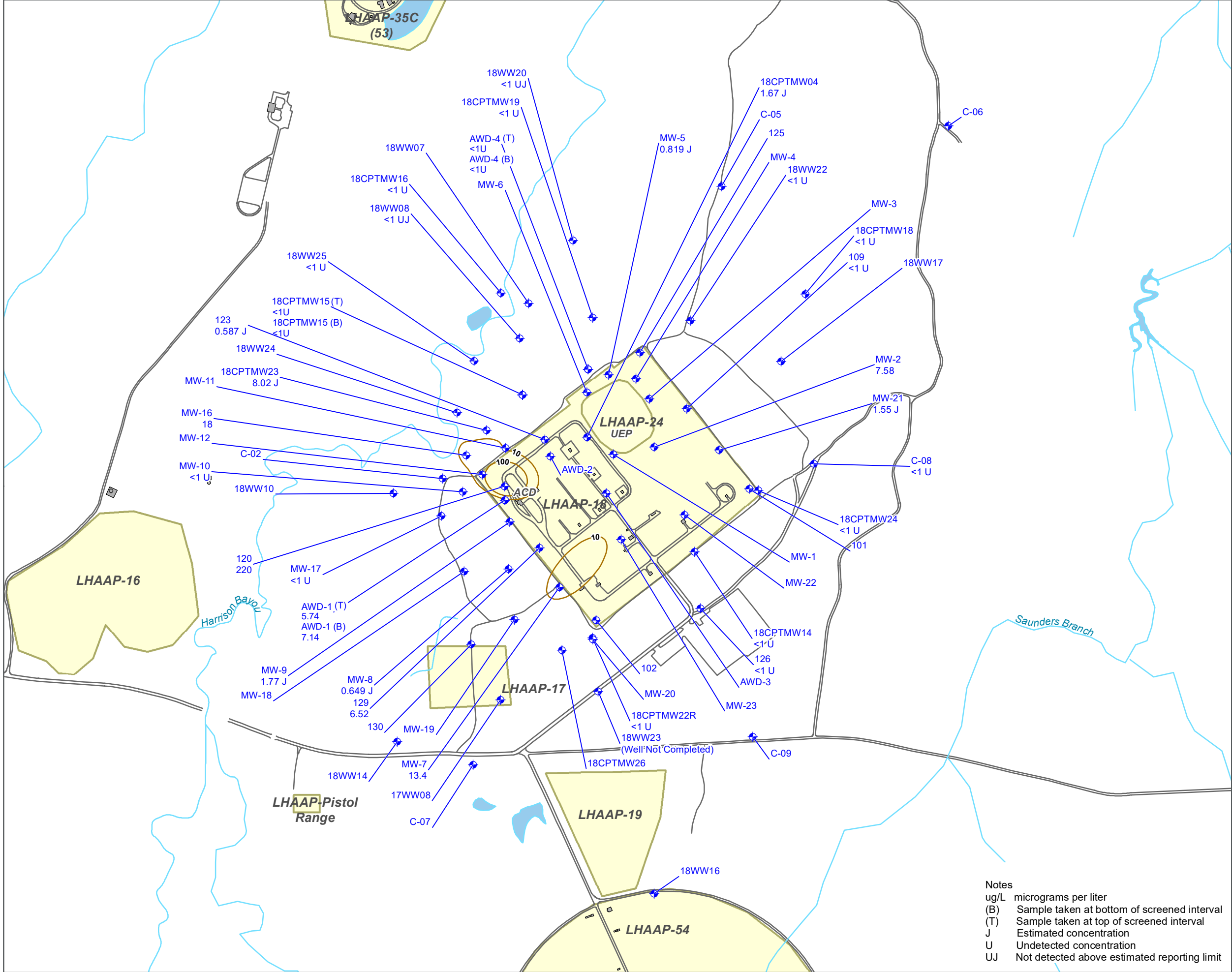


FIGURE 2-10

- Notes
- ug/L micrograms per liter
  - (B) Sample taken at bottom of screened interval
  - (T) Sample taken at top of screened interval
  - J Estimated concentration
  - U Undetected concentration
  - UJ Not detected above estimated reporting limit



LEGEND

- Shallow Zone Monitoring Well with Well ID and 1,4-Dioxane Concentration in ug/L
- 1,4-Dioxane Contour (ug/L)
- Streams
- Ponded
- Roads
- Buildings
- Site

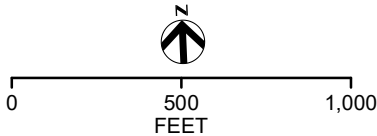
ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

1,4-DIOXANE ISOPLETH CONTOURS  
IN SHALLOW ZONE (JUNE 2016)

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

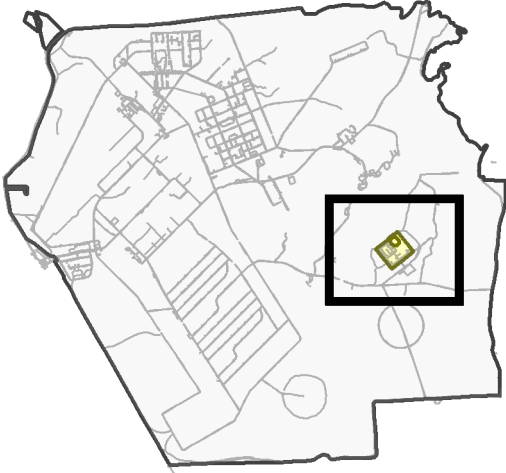
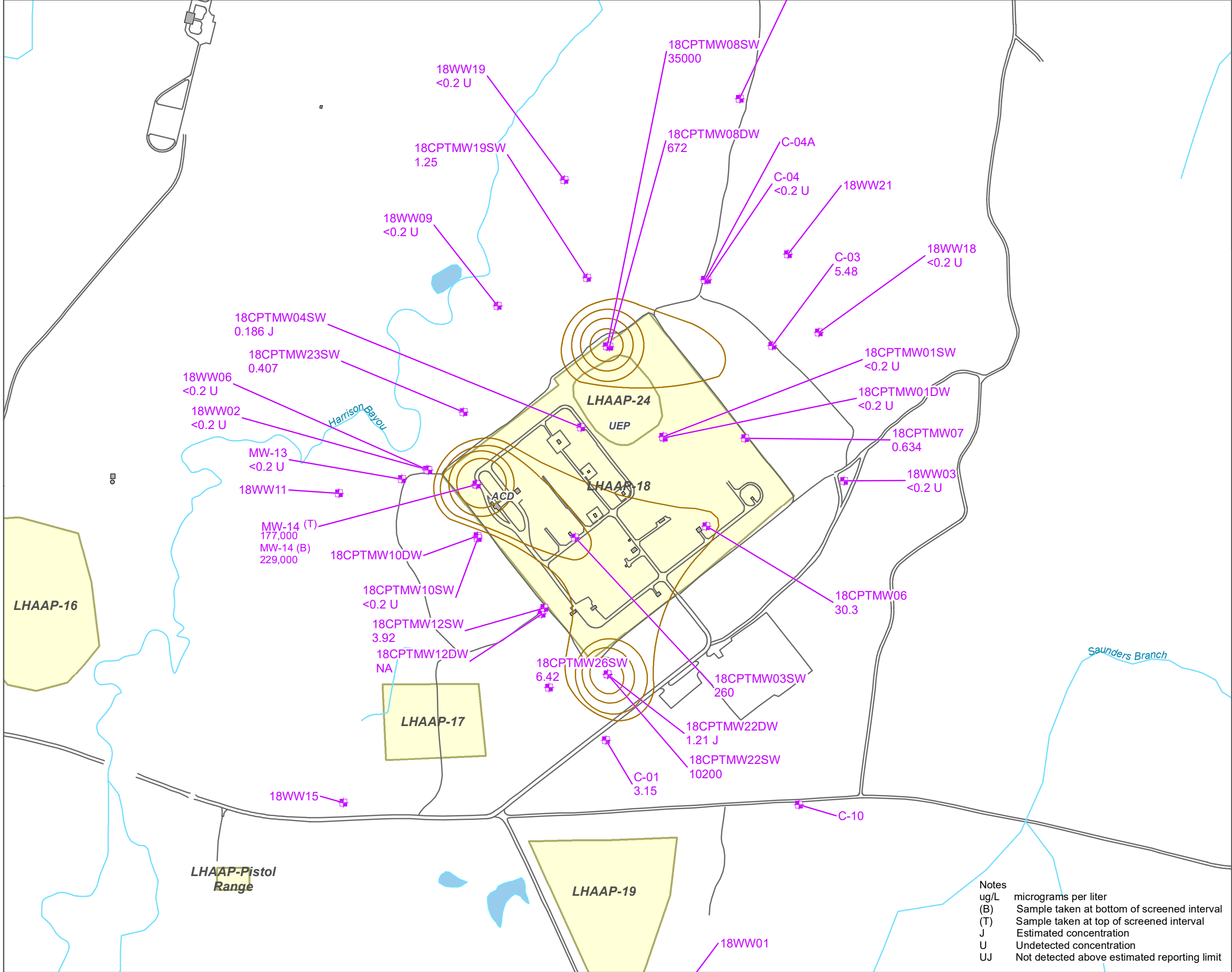


- Notes
- ug/L micrograms per liter
  - (B) Sample taken at bottom of screened interval
  - (T) Sample taken at top of screened interval
  - J Estimated concentration
  - U Undetected concentration
  - UJ Not detected above estimated reporting limit



FIGURE 2-11





LEGEND

- Wilcox Formation Monitoring Well with Well ID and Perchlorate Concentration in ug/L
- Perchlorate Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

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PERCHLORATE ISOPLETH CONTOURS  
WILCOX FORMATION (JUNE 2016)

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

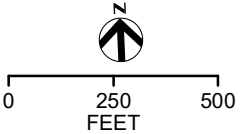
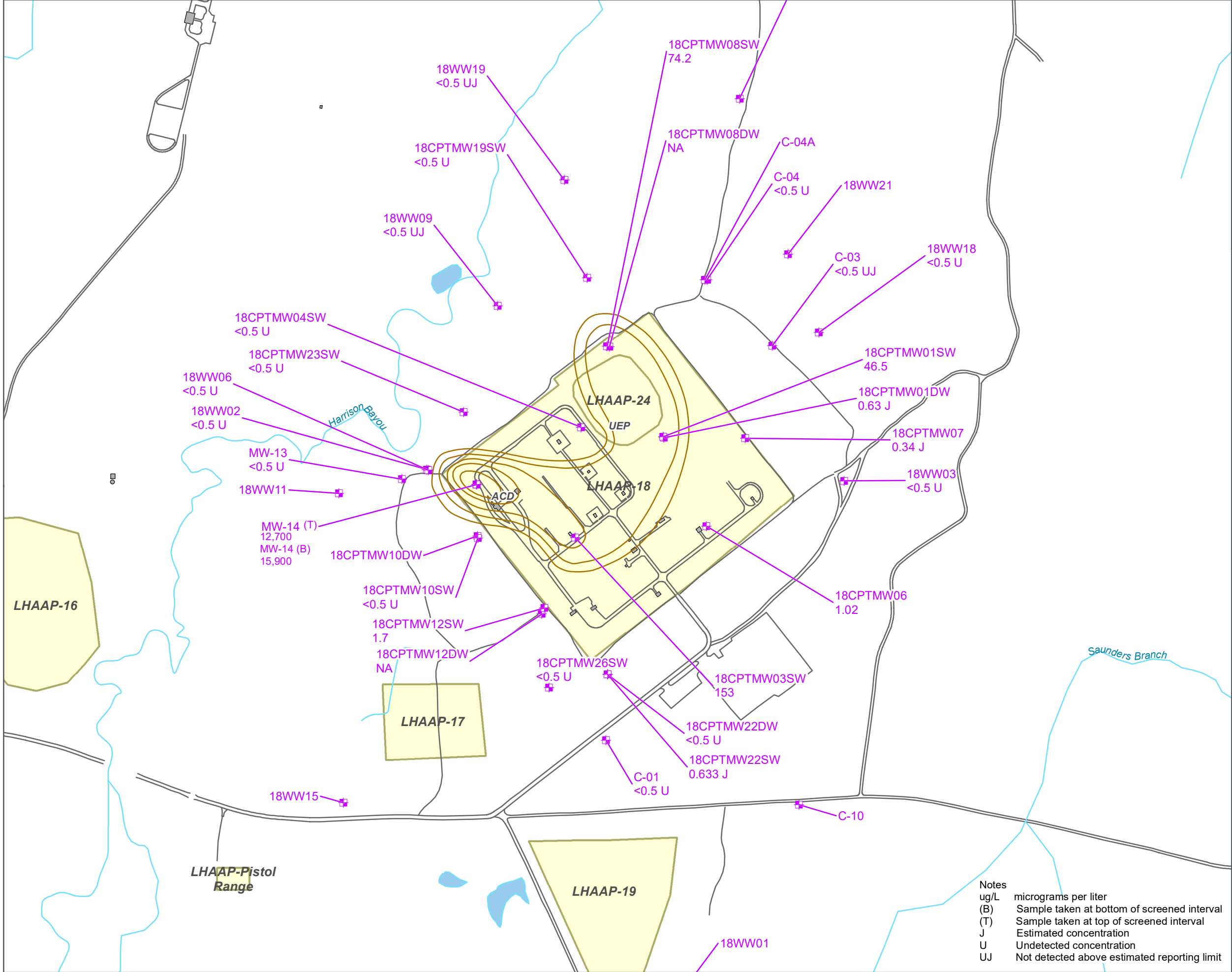


FIGURE 2-12



LEGEND

- Wilcox Formation Monitoring Well with Well ID and Trichloroethene Concentration in ug/L
- Trichloroethene Contour (ug/L)
- Streams
- Ponded
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

TRICHLOROETHENE ISOPLETH CONTOURS  
WILCOX FORMATION (JUNE 2016)

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

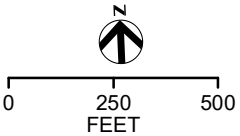
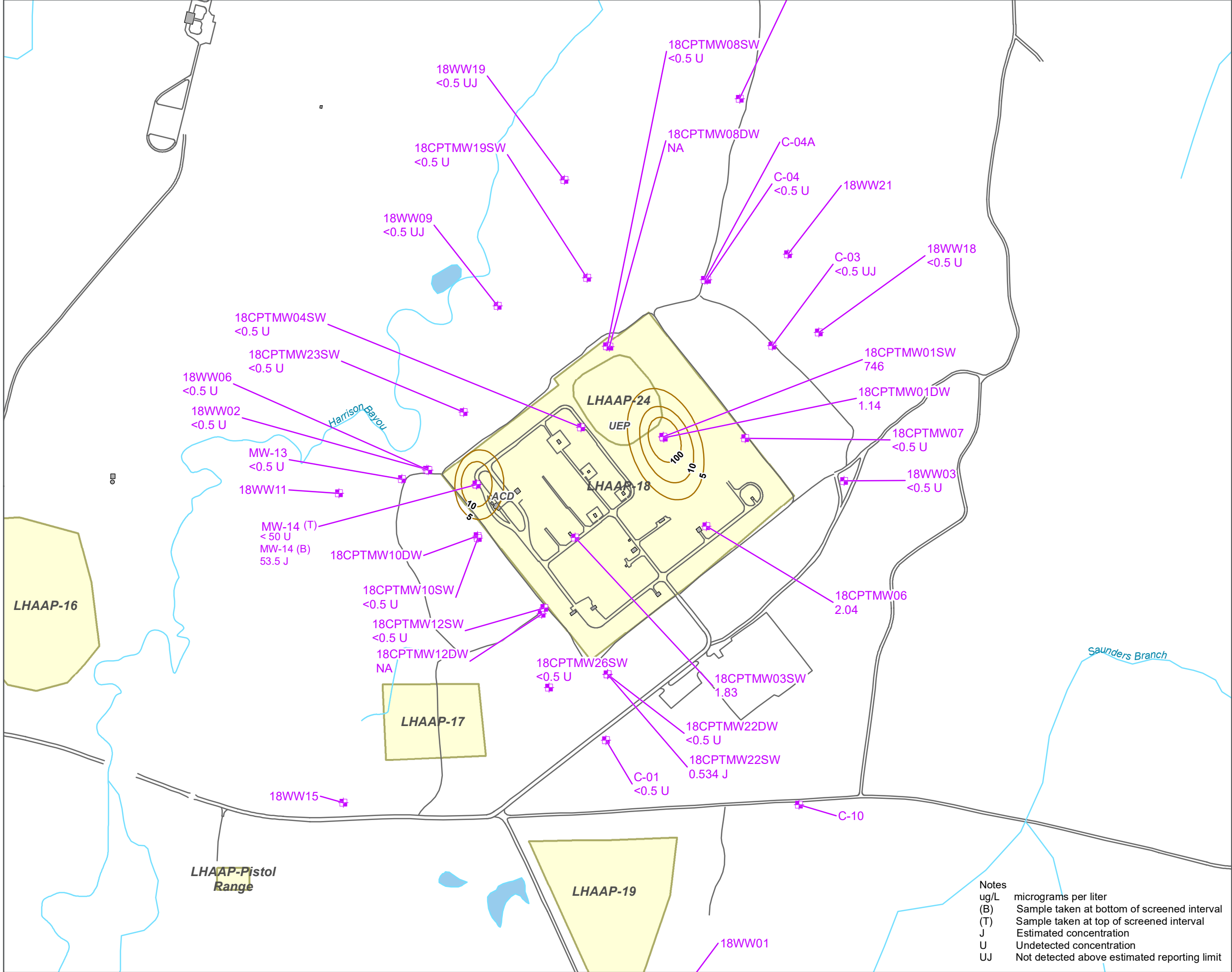


FIGURE 2-13



LEGEND

- Wilcox Formation Monitoring Well with Well ID and Methylene Chloride Concentration in ug/L
- Methylene Chloride Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

**METHYLENE CHLORIDE ISOPLETH  
CONTOURS WILCOX FORMATION (JUNE 2016)**  
LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

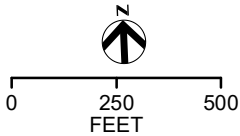
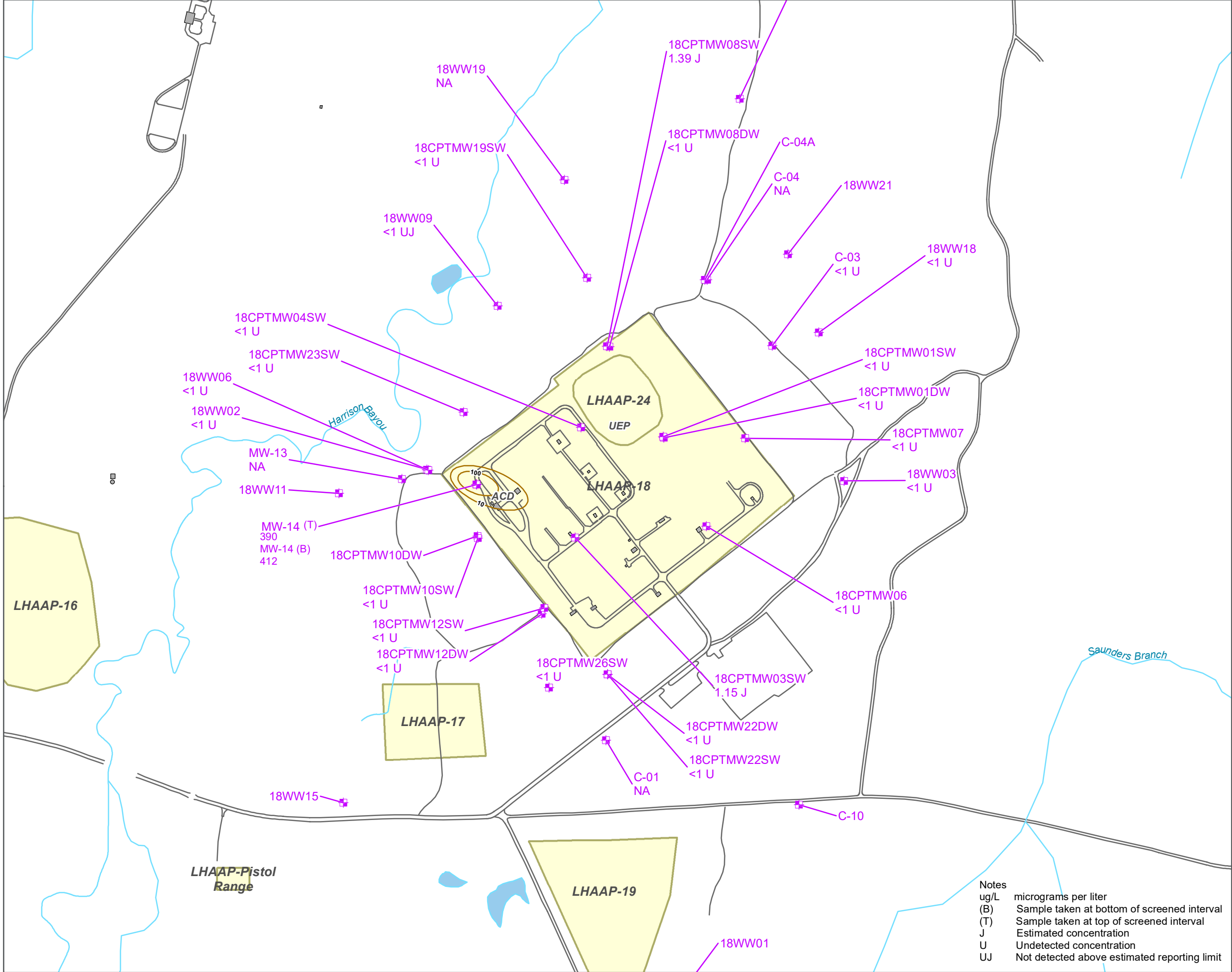


FIGURE 2-14





LEGEND

- Wilcox Formation Monitoring Well with Well ID and 1, 4-Dioxane Concentration in ug/L
- 1, 4-Dioxane Contour (µg/L)
- Streams
- Ponded Area
- Roads
- Buildings
- Site

ACD – Air Curtain Destructor  
UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

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**1, 4-DIOXANE ISOPLETH CONTOURS  
WILCOX FORMATION (JUNE 2016)**

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

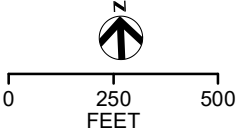
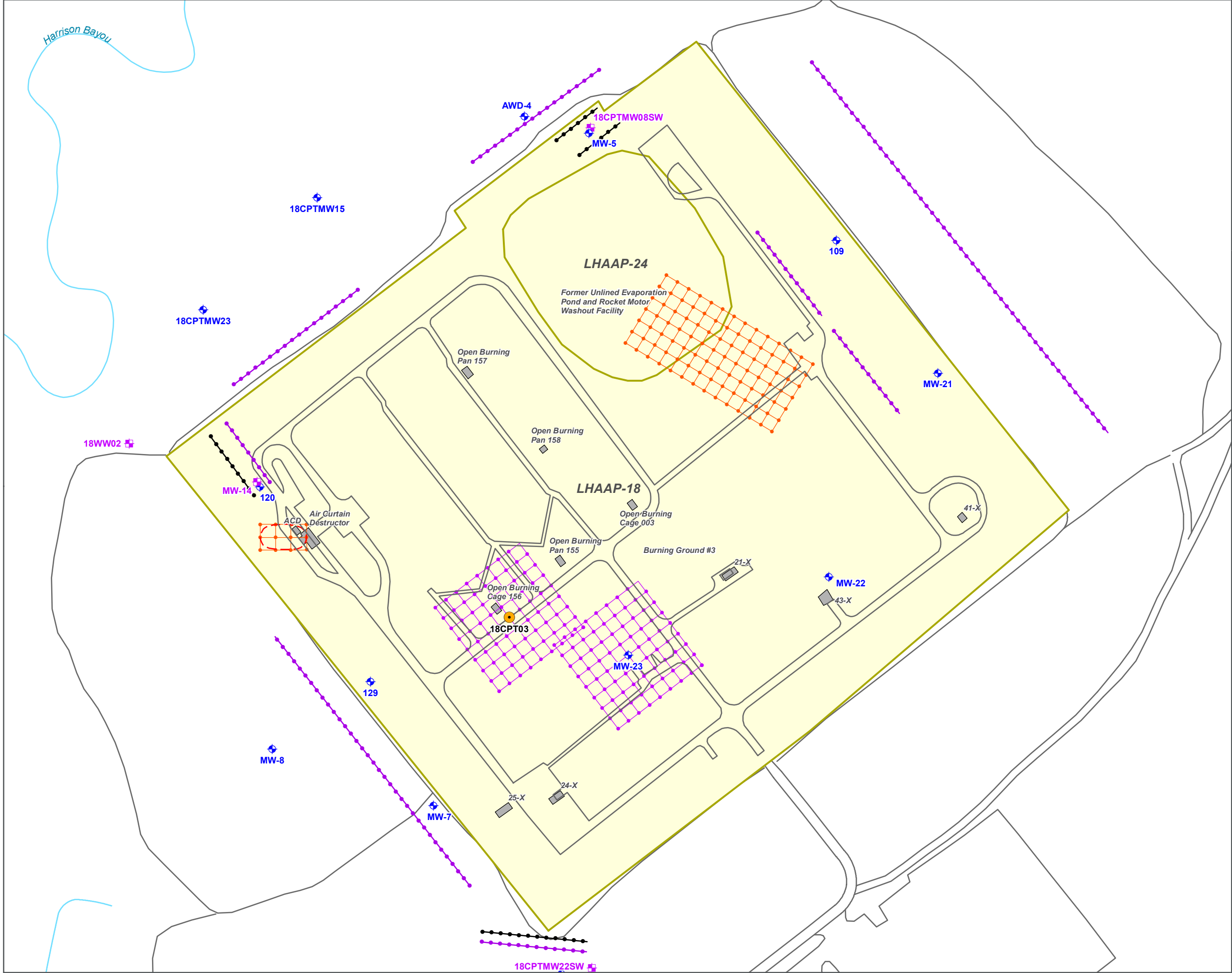


FIGURE 2-15





LEGEND

- Road
- Stream
- Site
- Former Building or Concrete Slab
- Shallow Zone Monitoring Well
- Wilcox Formation Monitoring Well
- Soil Boring - May 2013

Alternative 5 Activities

- Shallow Zone ISB
- Wilcox ISB
- Shallow Zone ISB Grid
- Shallow Zone ISB Grid after DNAPL Removal

Notes

ISB In-Situ Bioremediation

Barriers, grids and other remedy component features shown in this figure were used to facilitate comparison of alternatives including costs. The locations, number and layout may change during Remedial Design phase.

ACD – Air Curtain Destructor

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.

ENHANCED IN-SITU BIOREMEDIATION LOCATIONS

LHAAP 18/24

LONGHORN ARMY AMMUNITION PLANT

KARNACK, TEXAS

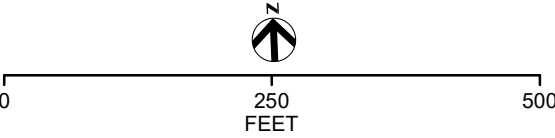
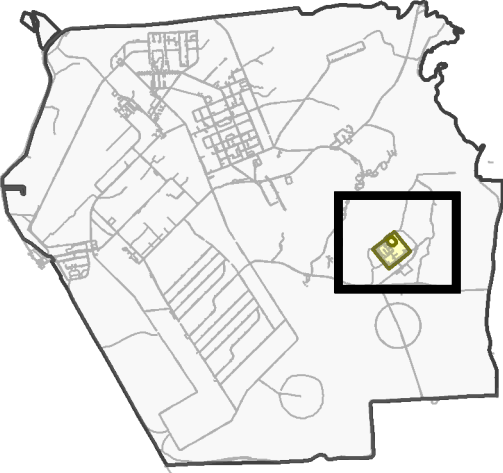
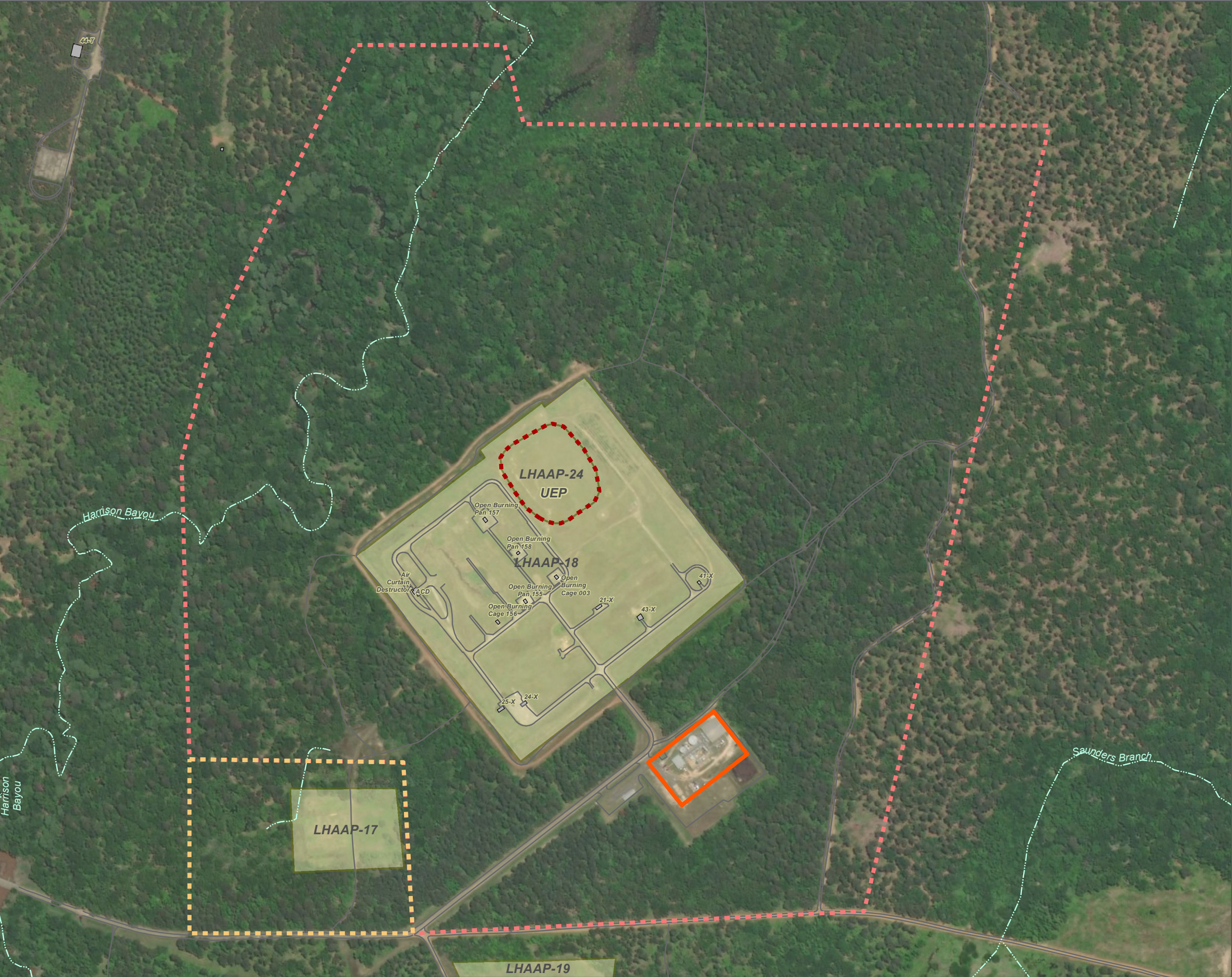


FIGURE 2-17





LEGEND

Preliminary Land Use Control Boundary

- LUC 17
- LUC 18
- LUC 24 (UEP)
- GWTP – Groundwater Treatment Plant
- Roads
- Streams
- Buildings
- Site

ACD – Air Curtain Destructor, UEP – Unlined Evaporation Pond

DATA SOURCES: AECOM, 2017. Final Revised Feasibility Study for LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas, January.

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PRELIMINARY LAND USE CONTROL BOUNDARY

LHAAP 18/24  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

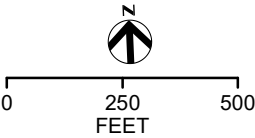


FIGURE 2-18





### 3. 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-18/24 as presented in the PP. 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. One public comment period and public meeting were held for the LHAAP-18/24 PP. Responsiveness summaries for the meeting are provided below.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-18/24 through a public meeting, the Administrative Record for the facility, and an announcement published in the Shreveport Times and Marshall News Messenger newspapers. **Section 2.3** discusses community participation on LHAAP-18/24, including the dates for the public comment period, the date, location, and time of the public meeting, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record for the comment period and public meeting:

- Transcript of the public meeting held on April 25, 2019;
- Presentation slides from the April 25, 2019 public meeting;
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments, presented in this ROD; and

### Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including comments received from the public and community groups in written and verbal form. Verbal comments and questions were discussed and addressed during the public meeting on April 25, 2019 and are summarized below. Responses to written comments are presented following the verbal comments.

#### 2019 Proposed Plan Verbal Comments

**Question/Comment:** Looking at the figure against the wall that shows the plumes in the Shallow Zone it also shows an area for monitored natural attenuation. But all the plumes are not covered by that MNA area. Could you explain why?

**Response:** *The reason that all of the wells within the plumes aren't part of the MNA area is because they are upgradient of where the contamination is. So, historically, those concentrations haven't been increasing because the primary flow direction is towards the bayou. The gray area represents the area where we will be monitoring for concentrations to be dropping over time demonstrating that natural attenuation is occurring. But some of those upgradient wells may be part of the sampling program and be monitored for natural attenuation parameters also. A lot of this is decided in the remedial design phase, so this is the '10,000-foot look' at what the remediation alternative is, and then you really get into the details during the remedial design phase.*





**Question/Comment:** I have a question about where you intend to use EISB. You said that was inside and outside the containment area, but on your maps it seems to me the locations are all inside the containment area.

**Response:** *There are lines shown outside the containment area that represent linear ISB injection locations. Again, this is the conceptual design, so the actual locations may shift during the remedial design to better address the contamination.*

**Question/Comment:** When I evaluate these kind of plans, there are three questions I try to answer. First is, have all the contaminants been identified; the second is, has the extent of contamination been determined--that's both horizontally and vertically--and, finally, if the proposed plan is implemented, is it likely to clean up contaminants in a reasonable amount of time. And my initial answers to all three of those questions is yes. I think that you've identified all the contaminants; you've identified the extent; and as far as the cleanup plan working, I am concerned mostly with DNAPL, because we all -- for those of you who have been involved, you know that DNAPLs are probably the most difficult thing to clean up that we deal with. And this technology that you plan to use is new to me; but I've done a little research on it, and I went looking for examples where the technology didn't work, but I was unable to find an example where it didn't work. It might be out there; but in all the cases I've looked at, have worked, so I think it's quite promising. I do have one criticism, though, and that has to do with metals. You've mentioned the fact that metals are present in groundwater, including arsenic and chromium; but nowhere in any of the documents I've looked at does the Army explicitly say "This is how we're going to clean up the metals", or do they say, alternatively, "We don't need to clean up the metals". I think that we need more explanation of what you intend to do, if anything, about the metals. Other than that it's a good and reasonable plan.

**Response:** *Thank you. The metals will be addressed through monitoring over time and will be evaluated at five year reviews. If any further action is required to demonstrate protectiveness, that also will be addressed during the five year review.*

#### 2019 Proposed Plan Written Comments

**Question/Comment:** DNAPLs are the most difficult contaminants to remove from an aquifer. The thermal technology that the Army is proposing to use is probably the most effective means of cleaning up DNAPL that is available.

**Response:** *No response required.*

**Question/Comment:** Groundwater at the site is contaminated with metals (see tables 1 and 2). However, the Army has not clearly stated what, if anything, it intends to do about the metals. The Army should either 1) develop a plan that clearly states how it intends to clean up metals, or 2) explain why the cleanup is unnecessary.

**Response:** *Isolated detections of metals in the shallow zone at concentrations exceeding the MCLs/PCLs occur across the site, but without the clear plume patterns exhibited by VOCs. The major metals in the Shallow Zone are arsenic, barium, and chromium. The other metals (cobalt and nickel) are not detected consistently. In the Wilcox Formation, sporadic detections of arsenic above the MCL were reported in three wells. Groundwater monitoring will be conducted to evaluate metals and the need to continue monitoring for metals will be evaluated at five year intervals. In addition,*



*the LUCs that will be put in place will prevent human exposure to unacceptable metals concentrations.*

**Question/Comment:** There are three areas in the Wilcox Formation where the vertical extent of groundwater contamination has not been determined. The first is in the north central portion of the site, at well 18CPTMW01DW. Methylene chloride concentrations at this well exceed the drinking water standard. The second is along the northern boundary of the site, at well 18CPTMW08DW. Perchlorate concentrations at this well exceed the drinking water standard. The third is in the western corner of the site, at well M-14. Perchlorate, solvents (e.g., methylene chloride, TCE), and 1,4-dioxane concentrations exceed the drinking water standards.

The Army should install additional wells in these areas to determine the vertical extent of contamination.

**Response:** To clarify, the vertical extent of all wells outside the contained area has been determined. However, the three wells identified are inside the contained area. Well 18CPTMW01DW has been below MCL for methylene chloride in 2016 and 2018 sampling events and will continue to be monitored to ensure vertical extent is defined. While 18CPWMW08DW has remained above the PCL for perchlorate and MW-14 has remained above the cleanup standards for perchlorate, MC and TCE and 1,4-dioxane during 2016 and 2018 sampling events, it is anticipated that the RD will include ISB treatment for these two sections of the site. The Army intends to implement the active remediation in these areas prior to considering installing any deeper wells to avoid creating a potential conduit for downward migration.

**Question/Comment:** With regard to 18/24, we heard the contractor, HDR, state that the vertical extent was known. Can they please tell us which wells were used to determine the vertical extent and the accompanying analysis of those wells over time?

**Response:** *The statement made during the presentation should have been limited to the areas outside the contained area. The vertical extent is not defined at two of the locations cited in the previous comment. See previous response.*

**Question/Comment:** The Army claims that the In-situ Thermal Treatment system will remove 99.9% of the DNAPL at site 18/24. However, the Army does not provide a reference to information that supports this claim. The Army should state where the information can be found.

**Response:** *The estimate for removal efficiency was obtained from Vendor-supplied information for thermal treatment technologies. Additional information regarding performance of thermal technologies is available at: <https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Persistent-Contamination/ER-200314/ER-200314-TR>.*

**Question/Comment:** The Army estimates that cleanup will be completed in 20 years. However, the Army does not provide a reference to the calculations that support this estimate. The Army should state where the calculations can be found.

**Response:** *The cleanup duration is described in the January 2017 Revised Feasibility Study Report – LHAAP-18/24. The cleanup duration is based on the Natural Attenuation Evaluation included in Appendix A of the FS.*



## 4. References

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## **Appendix A**

### **Public Notice Affidavits**





# THE MARSHALL News Messenger

The Marshall News Messenger

309 E Austin

Marshall, TX 75670

04/03/19

Phone:(903) 935-7914 Fax:(903) 935-6242 Email:

## AFFIDAVIT OF PUBLICATION

State of Texas)

County of Harrison)

This Affidavit of Publication for the Marshall News Messenger, a daily newspaper of general circulation, printed and published at Marshall, hereby certifies that the attached legal notice, ad # 640129, was published in said newspaper on April 3, 2019, and that copies of each paper in which said Public Notice was published were delivered by carriers to the subscribers of said paper, according to their accustomed mode of business in this office.

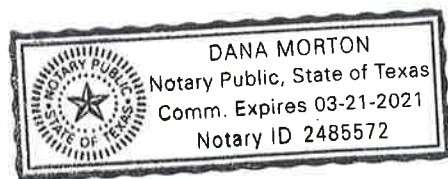
Dianne Gray  
for the Marshall News Messenger

The above Affidavit and Certificate of Publication was subscribed and sworn to before me by the above-named Dianne Gray, who is personally known to me to be the identical person in the above certificate on this 12th day of

April, 2019.

Dana Morton  
Notary Public in and for  
State of Texas)  
County of Harrison)

My commission expires 3-21-21



**PUBLIC NOTICE**  
**THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR THE FINAL REMEDY FOR ENVIRONMENTAL SITE UHAAP-18/24, BURNING GROUND NO. 3 AND UNLINED EVAPORATION POND, LONGHORN ARMY AMMUNITION PLANT, TEXAS.**

**PUBLIC MEETING ON APRIL 25, 2019**  
**AT THE KARNACK COMMUNITY CENTER, KARNACK, TX**

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (UHAAP). In partnership with the U.S. Environmental Protection Agency Region 6 (USEPA), the lead Oversight Agency, and Texas Commission on Environmental Quality, the Supporting Agency, the U.S. Army has developed the Proposed Plan for site UHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond. Although the Proposed Plan identifies the preferred final remedy for the site, the U.S. Army welcomes the public's review and comment. Beginning on April 2, 2019, 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 and on the UHAAP website at <http://www.longhornarmy.com/UHAAP-18-24>. The public comment period is April 2, 2019 through May 2, 2019. The public meeting will be held on Thursday, April 25, 2019 at the Karnack Community Center, Karnack, TX beginning at 6:00 PM and ending at 7:30 PM. The Karnack Community Center is located at Highway 134 and Spur 449 near the front gate of the Caddo Lake National Wildlife Refuge. 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.

UHAAP is an inactive, government-owned, formerly contractor-operated industrial facility located in central-east Texas in the northeastern corner of Harrison County. The former installation occupied nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. UHAAP 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 production of secondary explosives, rocket motor propellants, and various pyrotechnics. UHAAP 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.

UHAAP-18/24, known as the Burning Ground No. 3 (18) and Unlined Evaporation Pond (UEP) (24), is a 34.5 acre fenced, cleared area (containment area) located in the undisturbed section of UHAAP. The area was used for the treatment, storage, and disposal of solid and liquid explosives, pyrotechnic, and combustible solvent waste by open burning/open deflagration, incineration, evaporation, and burial. UHAAP-18 Burning Ground No. 3 operated between 1955 and 1968 and UHAAP-24 UEP was used to collect water from the washout of rocket motor casings and process waste sumps from 1963 to 1984.

The Proposed Plan for UHAAP-18/24 addresses potential risks associated with exposure to contaminated soil and groundwater in both the shallow zone and Wilcox formation and also prevents contaminated groundwater from migrating and impacting surface water at unacceptable levels. The full list of alternatives evaluated is: 1) no action; 2) enhanced groundwater extraction and on-site treatment; and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced shallow bioremediation (ESB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, ESB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, ESB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from UHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and ESB; employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will permanently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the site.

For further information or to submit written comments, contact:  
Dr. Rose M. Zeller, Longhorn Army Ammunition Plant, R0, Box 220, Ratcliff, Arkansas, 72091.  
phone number 479-635-0110 or email [rose.m.zeller@army.mil](mailto:rose.m.zeller@army.mil).

# The Times

State of Louisiana

Parish of Caddo

**AFFIDAVIT OF PUBLICATION**


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 , personally known to me who being duly sworn, deposes and says that he/she is the LEGAL CLERK, for The Times, and that the attached advertisement published entitled:

PUBLIC NOTICE THE UNITED STATES ARMY  
INVITES PUBLIC COMMENT ON THE PROPOSED  
PLAN FOR THE FINAL REMEDY FOR  
ENVIRONMENTAL SITE LHAAP-18/24, BURNING  
GROUND NO. 3

**Notice published in the Times on 04/05/19**

(Signed) 

9/5/2019

Notary Public. State of Wisconsin. County of Brown

  
8-25-23

My commission expires

SHELLY HORA  
Notary Public  
State of Wisconsin



**PUBLIC NOTICE  
THE UNITED  
STATES ARMY  
INVITES PUBLIC  
COMMENT ON THE  
PROPOSED PLAN  
FOR THE FINAL  
REMEDY FOR  
ENVIRONMENTAL  
SITE LHAAP-18/24,  
BURNING GROUND  
NO. 3 AND  
UNLINED  
EVAPORATION  
POND,  
LONGHORN ARMY  
AMMUNITION  
PLANT, TEXAS  
PUBLIC MEETING  
ON APRIL 25, 2019  
AT THE KARNACK  
COMMUNITY  
CENTER,  
KARNACK, TX**

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LHAAP-18/24, known as the Burning Ground No. 3 (18) and Unlined Evaporation Pond (UEP) (24), is a 34.5 acre fenced, cleared area (containment area) located in the south-eastern section of LHAAP. The area was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and combustible solvent waste by open burning/open defonation, incineration, evaporation, and burial. LHAAP-18 Burning Ground No. 3 operated between 1955 and 1998 and LHAAP-24 UEP was used to collect water from the washout of rocket motor casings and process waste sumps from 1963 to 1984.

The Proposed Plan for LHAAP-18/24 addresses potential risks associated with exposure to contaminated soil and groundwater in both the shallow zone and Wilcox formation and also prevents contaminated groundwater from migrating and impacting surface water at unacceptable levels. The full list of alternatives evaluated is: 1) no action; 2) enhanced groundwater extrac-

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The Proposed Plan for LHAAP-18/24 addresses potential risks associated with exposure to contaminated soil and groundwater in both the shallow zone and the Wilcox formation and also prevents contaminated groundwater from migrating and impacting surface water at unacceptable levels. The full list of alternatives evaluated is: 1) no action; 2) enhanced groundwater extrac-

tion and ex-situ treatment, and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced in-situ bioremediation (EISB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal; and 6) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from LHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and EISB, employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will perma-

tion and ex-situ treatment, and land use controls (LUCs) in the shallow zone and Wilcox formation, enhanced in-situ bioremediation (EISB) inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal; 3) groundwater extraction and treatment, monitored natural attenuation (MNA) outside the containment area in the shallow zone and Wilcox formation, LUCs in the shallow zone and Wilcox formation, and containment; 4) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and surfactant enhanced dense non-aqueous phase liquid (DNAPL) removal; 5) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal; and 6) enhanced groundwater extraction and treatment, LUCs in the shallow zone and Wilcox formation, EISB inside & outside the containment area in the shallow zone and Wilcox formation, unsaturated soil excavation and off-site disposal, and enhanced DNAPL remediation using zero-valent iron (ZVI). Based on available information, the preferred remedy is Alternative 5, which would remove contaminated soil from LHAAP-18/24 with off-site disposal; reduce groundwater contamination in the shallow zone and Wilcox formation through extraction and treatment and EISB, employ thermal DNAPL removal, and ongoing LUCs to assure protection of human health and the environment. Through the use of treatment technologies, Alternative 5 will perma-

nently reduce the toxicity, mobility, and volume of source materials that constitute the principal threat wastes at the site.

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 email [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).  
The Times  
April 5, 2019

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The Times  
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**Subject:** Final Monthly Managers' Meeting (MMM),  
Longhorn Army Ammunition Plant (LHAAP)  
**Location of Meeting:** Teleconference  
**Date of Meeting:** 20 February 2020– 10:00 Central Standard Time (CST)

**Attendees:**

Army BRAC: Rose M. Zeiler (RMZ)  
USEPA: Bill Rhotenberry (BR) and Kent Becher (KB)-USGS Liaison  
TCEQ: April Palmie (AP)  
USACE: Aaron Williams (AW),  
Bhate: Kim Nemmers (KN), Scott Beesinger (SB) and Marcia Olive (MO)  
APTIM: Bill Foss (BF) and Praveen Srivastav (PS)  
USFWS: Paul Bruckwicki (PB)

**Defense Environmental Restoration Program (DERP) Performance-Based Remediation (PBR) Update**

**Installation Wide Work Plan**– KN explained that perchlorate was currently analyzed in Salt Lake City, Utah and that the majority of groundwater analyses were completed in the Houston location. KN said that the Houston location would now run perchlorate due to updated certification. MO said that it is the same method being used at both laboratory locations. MO explained that a total of seven worksheets need a revision to reference the correct Standard Operating Procedures (SOPs). MO said that the quality control (QC) remains the same. MO stated that Worksheet 15 changes the detection limits. AP asked if the detection limit changes. MO said that the detection limits are lower with Houston. MO explained that perchlorate was run by Houston in error and that the results had the lower detection limit. MO explained that the limit of detection for perchlorate is 2.0 micrograms per liter (µg/L) from Salt Lake City but is 0.05 µg/L for the Houston laboratory. KN asked if we can move forward using the Houston laboratory location. AP asked if the Houston Laboratory had the proper certifications. MO said that the Houston laboratory has the National Environmental Laboratory Accreditation Program certification for perchlorate. AP agreed for the Houston laboratory to run perchlorate if it has the proper certification(s). BR concurred. KN then asked if anyone needed a compact disc (CD) of the revised Installation Wide Work Plan or if posting on SharePoint was sufficient. RMZ asked for a CD. AW and AP indicated that they could pull the electronic copy from SharePoint.

**Groundwater Treatment Plant (GWTP)** – SB said that the GWTP is running satisfactorily and that that here is quite a bit of water being treated due to the rainfall. SB said that they are changing out a valve on the truck loading for the acid tank. SB said that additional acid will then be delivered the following week and that an acid wash will then be completed for the air stripper. SB explained that the acidic water will be pumped through the top and then collect it at the bottom. SB said that the goal is do the air stripper should be washed in the next week or so. KN explained that the media is in pretty good shape so flushing a couple of time should make a big different. KN also explained that we are able to continue to discharge to the bayou.

SB explained that he needed to move the ladder to the granular activated carbon (GAC) vessels to evaluate the weld around nozzle of the vessels to see what needs to be done to repair. SB explained that the weld had rusted and that it was leaking out previously. If the repair can be completed, then SB will try to backwash the GAC vessels.

**LHAAP-04 and 46**– PS said that the sampling was completed for both of LHAAP-04 and LHAAP-46 in February 2020. KB asked SB if there were a lot of dry wells. SB said that there were 7 or 8 dry wells. SB said that the wells normally dry were still dry.

**LHAAP-16**- PS said that the first round of design effectiveness sampling was completed. BF explained that the sampling was completed from November 2019 through January 2020, and that Biobarrier 2 injections were completed two days before Christmas. Therefore, BF explained that the design effectiveness sampling was completed on 23 January 2020. PS explained that total organic carbon re-analysis was required for some of the samples. PS explained that some of the wells would be resampled to further evaluate design effectiveness and will be included in the Remedial Action Completion Report (RACR). PS said the additional sampling will be completed in March. PS said that year 1 quarter 1 performance sampling at LHAAP-16 will also be completed in March and includes approximately 50 monitoring wells.

**LHAAP-50** – PS said that injections are planned for the first week of 9 March 2020. PS said that the Underground Injection Control (UIC) notification was sent out to TCEQ on 5 February 2020. AP said she received the UIC information. PS said that the 9 March mobilization date was selected because it is about 30 days out from submittal of UIC notification. PS said that most of LHAAP-50 is accessible but a portion of the site may be difficult to access. PS said that injections will be postponed if the wet conditions continue.

**Well abandonment** - PS said that the well abandonment is planned for the week of 2 March 2020. PS said that SB is evaluating for wet conditions and accessibility of each wells.

**Enforceable Schedule** - RMZ wants to set up a call to discuss the enforceable schedule with AP and BR. AP, BR and RMZ agreed to discuss on Tuesday, 25 February 2020.

**Post-Screening Investigation (PSI) Scoping** - AW said that HDR, Inc. (HDR) is going ahead to get quotes for the modification that will be issued. AW explained that, for the one deep well, the driller is asking if the new monitoring well can be a 2-inch diameter well to use sonic drill versus the 4-inch diameter well, which will require mud rotary. AP confirmed that the deep well is being installed for groundwater delineation. AW said that soil samples are not being collected during installation of this one deep well. AW said that the deep well is just for evaluating groundwater. RMZ said that the location of the well will still get Regulatory input. AP asked if you can get a core with sonic and why not hollow-stem? AW explained that the driller said that only mud rotary is available at the depth. AP wondered what KB thoughts were. KB agreed that avoiding mud rotary is preferred especially with the potential for heaving sands. KB said that a 2-inch diameter monitoring well is fine for groundwater sampling but if you wanted to do passive sampling or something else that the 2-inch diameter monitoring well may limit you. RMZ said that if additional investigation is need for the deep aquifer, then additional monitoring wells would be needed also – which could then be installed as 4-inch wells. KB said that USEPA used sonic drill rig and ran into issues in a sandier site. RMZ said that the driller could be asked for their experience in similar soils but felt the driller would not recommend the use of sonic if they were not experienced. AP said that she is good with the 2-inch monitoring well but is also interested in hear about the driller experience. BR is good with trying it and putting in a 2-inch monitoring well. BF suggested that AW verify that they are telescoping. AW said that HDR had already clarified that telescoping would be used.

KN asked everyone to refer to the Document and Issues Tracking Table dated February 20, 2020.

- **Task 1** (Project Management) – KN stated that minutes for the MMM and Restoration Advisory Board (RAB) in January are out as final or to the RAB members for approval at the April 2020 RAB meeting.

- **Task 3** (LHAAP-03) – PS said that one wall of the excavation still needs to be further excavated for arsenic. PS said that the water is still present so the wall excavation has not been completed and is awaiting drier conditions.
- **Task 4** (LHAAP-04) – PS said that injections are done and that the RACR is being prepared. PS said that the RACR is listed as being due out in March to the Regulators, which may be tight with Army reviews such that the document may get pushed out for Regulatory review until April 2020.
- **Task 5** (LHAAP-12) – PS said that the Remedial Action Operation (RA-O) sampling for LHAAP-12 was completed in December 2019 and that the validated data was included in February 2020 MMM data validation package. BF said that the new monitoring well results were clean. PS said that the 2019 Annual RA-O Report was in preparation.
- **Task 6** (LHAAP-16) – PS said that an additional round of design effectiveness sampling is planned for March 2020 and then that data will be provided. PS said that the RACR is being prepared with the draft report expected to be to the Regulators in May 2020.
- **Task 7** (LHAAP-17) – PS explained that drier conditions were needed to complete the backfilling of verified clean areas.
- **Task 9** (LHAAP-37) – PS stated that the Year 3 1<sup>st</sup> semiannual sampling results are included in the February 2020 MMM. PS stated that the Year 2 Annual RA-O Report was in internal review.
- **Task 10** (LHAAP-46) – PS stated that Year 5 Annual RA-O data report was in internal review and that the Year 6 sampling was just completed.
- **Task 11** (LHAAP-50) – PS stated that the Year 5 RA-O Report was in internal review. PS stated that the Remedial Design (RD)/Remedial Action Work Plan (RAWP) was approved and needed to be put into the Administrative Record (AR).
- **Task 12** (LHAAP-58) – KN stated that groundwater sampling of the eastern and western plumes had been completed in December 2019 and that the sampling results were included in the February 2020 MMM. KN stated that the next sampling event is planned for March 2020. KN explained that the sampling schedule was provided and that LHAAP-58 would be going from quarterly to semi-annual sampling in June 2020.
- **Task 13** (LHAAP-67) – PS stated the Year 5 Annual RA-O Report submitted to the Regulators on 7 February 2020.
- **Task 14** (LHAAP-001-R and -003-R) - KN stated that Land Use Control (LUC) inspections had been completed in January 2020 and that no damage was noted.
- **Task 16** (GWTP) – KN indicated that Regulator comments on the 3<sup>rd</sup> Quarter 2019 GWTP Report had been received and would be addressed in the 4<sup>th</sup> Quarter 2019 GWTP Report. KN stated that the 4<sup>th</sup> Quarter 2019 GWTP Report was being prepared for Army review.
- **Task 17** (LHAAP-18/24) – KN stated that the validated data from the LHAAP-18/24 sampling completed in December 2019 was provided with the other February 2020 MMM data.
- **Task 18** (Surface Water) – KN stated that 1<sup>st</sup> Quarter 2020 surface water samples had been collected and that there were no exceedances. KN stated that the results would be included in the 2020 MMM validated data.
- **Task 19** (LUC Management Plan) – Not discussed
- **Administrative Record (AR)** – PS stated that the AR through June 2019 was being produced for distribution.

**Update on other DERP Sites:**

- **LHAAP 18/24** –AW stated that the TCEQ had provided an approval letter. BR said that the ROD was in routing at the EPA now that the TCEQ letter was received.
- **LHAAP-29** – AW said that the Record of Decision (ROD) was being placed into the AR.
- **LHAAP-47** – AW explained that the Interim Addendum PSI Report #2 was being held awaiting the additional investigation.
- **Well Abandonment** – AW stated that only 50 monitoring wells were included in Bhate’s contract so the wells at Site 1 were not included in the abandonment list.

### **Schedule Next Managers’ Meeting**

The next MMM will be held on Tuesday, March 31, 2020 at 11:00 am CDT via conference call.

Meeting concluded at approximately 10:51 pm CST.

### **ACRONYM LIST**

|       |   |
|-------|---|
| µg/L  | micrograms per liter                      |
| AP    | April Palmie                              |
| APTIM | APTIM Federal Services, LLC               |
| AR    | Administrative Record                     |
| AW    | Aaron Williams                            |
| BF    | Bill Foss                                 |
| Bhate | Bhate Environmental Associates, Inc.      |
| BR    | Bill Rhotenberry                          |
| BRAC  | Base Realignment and Closure              |
| CD    | Compact Disc                              |
| CST   | Central Standard Time                     |
| DERP  | Defense Environmental Restoration Program |
| GAC   | Granular Activated Carbon                 |
| GWTP  | Groundwater Treatment Plant               |
| HDR   | HDR, Inc.                                 |
| KB    | Kent Becher                               |
| KN    | Kim Nemmers                               |
| LHAAP | Longhorn Army Ammunition Plant            |
| LUC   | Land Use Control                          |
| MMM   | Monthly Managers’ Meeting                 |
| MO    | Marcia Olive                              |
| PB    | Paul Bruckwicki                           |
| PBR   | Performance-Based Remediation             |
| PP    | Proposed Plan                             |
| PS    | Praveen Srivastav                         |
| PSI   | Post-Screening Investigation              |
| QC    | Quality Control                           |
| RAB   | Restoration Advisory Board                |
| RACR  | Remedial Action Completion Report         |
| RA-O  | Remedial Action – Operation               |
| RAWP  | Remedial Action Work Plan                 |
| RD    | Remedial Design                           |
| RMZ   | Rose M. Zeiler                            |
| ROD   | Record of Decision                        |
| SB    | Scott Beesinger                           |

|       |   |
|-------|---|
| SOP   | Standard Operating Procedure                  |
| TCEQ  | Texas Commission on Environmental Quality     |
| USACE | United States Army Corps of Engineers         |
| USEPA | United States Environmental Protection Agency |
| VOC   | Volatile organic compound                     |

**LHAAP Validated Data Packages for  
February 2020 Monthly Manager's Meeting**

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|                       |  |
|-----------------------|--|
| <b>GWTP Effluent</b>  | <i>Weekly Perchlorate Sampling – December 2019</i><br>Perchlorate (6850)   |
| <b>GWTP Effluent</b>  | <i>Weekly, Bi-Weekly, and Monthly Sampling – December 2019</i><br>Ammonia (350.3)<br>Ortho-Phosphate (365.3)<br>Total Organic Carbon (SM5310C)<br>VOC (8260C)<br>Metals (6020A)<br>Hexavalent Chromium (7196A)<br>1,4-Dioxane (8270D-SIM)<br>Anions (9056) |
| <b>GWTP Influent</b>  | <i>Monthly Sampling – December 2019</i><br>Metals (6020A)<br>Perchlorate (6850)<br>Hexavalent Chromium (7196A)   |
| <b>GWTP Quarterly</b> | <i>Influent and Effluent – December 2019</i><br>Oil and Grease (1664A)<br>Perchlorate (6850)<br>Metals (6020A)<br>1,4-Dioxane (8270D-SIM)<br>Chemical Oxygen Demand (410.4)<br>VOC (8260C)<br>Anions (9056)  |
| <b>LHAAP-18/24</b>    | <i>Semi-Annual Sampling – December 2019</i><br>Perchlorate (6850)<br>Metals (6020A)<br>VOCs (8260C)<br>1,4- Dioxane (8270D SIM)  |
| <b>LHAAP-58</b>       | <i>Semi-Annual Sampling Event– December 2019</i><br>Anions (9056)<br>VOC (8260C)<br>Total Organic Carbon (SM5310C)<br>Metabolic Acids (HPLC-METACIDS)<br>Dechlorinating Bacteria (CENSUS)<br>Dissolved Gases (RSK-175)<br>Arsenic (6020A)                  |
| <b>LHAAP-12</b>       | <i>Year 12 Annual Sampling-December 2019</i><br>Volatile Organic Compounds (EPA 8260)  |
| <b>LHAAP-37</b>       | <i>Year 3 Remedial Action - Operation Semiannual Sampling Event #1-<br/>November 2019</i><br>Volatile Organic Compounds (EPA 8260)   |

## GWTP Weekly/Effluent Perchlorate Sampling -December 2019

| Location ID:<br>Sample Date: | Units | Daily<br>Maximum<br>Conc | INF pond<br>(PCL) | LH18/24-<br>SP650_120319_AIX*<br>12/3/19*                    | LH18/24-<br>SP650_120319_AIX<br>12/3/19* | LH18/24-<br>SP650_121219_AIX<br>12/12/19** | LH18/24-<br>SP650_121719_BIX<br>12/17/19** | LH18/24-<br>SP650_121719_BIX<br>12/17/19** | LH18/24-<br>SP650_122319_BIX<br>12/23/19** | LH18/24-<br>SP650_123019_BIX<br>12/30/19** |
|------------------------------|-------|--------------------------|-------------------|--|--|--|--|--|--|--|
| Location Description         |       |                          |                   | Collected from a spigot on the discharge of effluent TK-650. |  |  |  |  |  |  |
|                              |       |                          |                   | Weekly   | Monthly EFF                              | Weekly                                     | Weekly                                     | Quarterly EFF                              | Weekly                                     | Weekly                                     |
| Perchlorate (6850)           |       |                          |                   |  |  |  |  |  |  |  |
| Perchlorate                  | µg/L  | 589                      | 17                | 1.2 J  | 1.3 J                                    | < 2.0 U                                    | 1.7 J                                      | 1.9 J                                      | 6.7  | < 2.0 U                                    |

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

AIX - after ion exchange

BIX - before ion exchange

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

\* discharged to INF Pond

\*\*discharged to Harrison Bayou

## GWTP Weekly Sampling - December 2019

| Location ID:<br>Sample Date:    | Units | Daily<br>Maximum<br>Conc | LH18/24-SP650_120319<br>12/3/19   | LH18/24-SP650_121219<br>12/12/19 | LH18/24-SP650_121719<br>12/17/19 | LH18/24-SP650_122319<br>12/23/19 | LH18/24-SP650_123019<br>12/30/19 |
|---------------------------------|-------|--------------------------|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Location Description            |       |                          | GWTP—Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly. |                                  |                                  |                                  |                                  |
| <b>Ammonia as N (350.3)</b>     |       |                          |   |                                  |                                  |                                  |                                  |
| Ammonia as N                    | mg/L  | NV                       | 3.9   | 8                                | 0.35                             | 4.3                              | 2.1                              |
| <b>Ortho-Phosphate (365.3)</b>  |       |                          |   |                                  |                                  |                                  |                                  |
| Ortho-Phosphate                 | mg/L  | NV                       | 0.733   | 1.23                             | 0.0110 J                         | 0.613                            | 0.537                            |
| <b>Organic Carbon (SM5310C)</b> |       |                          |   |                                  |                                  |                                  |                                  |
| Total Organic Carbon (TOC)      | mg/L  | NV                       | 1.5   | 0.99 J                           | 2.19                             | 2.46                             | 2.13                             |

mg/L - milligrams per liter

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues



## GWTP Bi-Weekly Sampling - December 2019\*

| Location ID:<br>Sample Date:              | Units | (Bayou) Daily<br>Maximum Conc | (INF pond)<br>MCL | LH18/24-<br>SP650_120419_BIX<br>12/4/19**   | LH18/24-SP650_120419_AIX<br>12/4/19** | INF Inlet_120419<br>12/4/19** | LH18/24-SP650_121219<br>12/12/19 | LH18/24-SP650_122319<br>12/23/19 | LH18/24-SP650_122719<br>12/27/19 | LH18/24-SP650_123019<br>12/30/19 |
|---|-------|-------------------------------|-------------------|---|---------------------------------------|-------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Location Description                      |       |                               |                   | GWTP - Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly. |                                       |                               |                                  |                                  |                                  |                                  |
| <b>Volatile Organic Compounds (8260C)</b> |       |                               |                   |   |                                       |                               |                                  |                                  |                                  |                                  |
| 1,1,1-Trichloroethane                     | µg/L  | 7,230                         | 200               | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| 1,1,2-Trichloroethane                     | µg/L  | 216.9                         | 5                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| 1,1-Dichloroethane                        | µg/L  | 14,032                        | NV                | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| 1,1-Dichloroethene                        | µg/L  | 253                           | 7                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| 1,2-Dichloroethane                        | µg/L  | 181                           | 5                 | 1.9   | 1.5                                   | < 0.50 U                      | 1.3                              | 1.5                              | 1.6                              | 1.5                              |
| 1,2-Dichloropropane                       | µg/L  | 5                             | 5                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Acetone                                   | µg/L  | 2,395                         | NV                | < 1.0 U   | < 1.0 U                               | < 1.0 U                       | < 1.0 U                          | < 1.0 U                          | < 1.0 U                          | < 1.0 U                          |
| Benzene                                   | µg/L  | 181                           | 5                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Carbon tetrachloride                      | µg/L  | 181                           | 5                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Chlorobenzene                             | µg/L  | 47,180                        | 100               | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Chloroform                                | µg/L  | 3,615                         | NV                | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| cis-1,2-Dichloroethene                    | µg/L  | NV                            | 70                | 41  | 55                                    | 2.8                           | 38                               | 35                               | 40                               | 32                               |
| Ethylbenzene                              | µg/L  | 57,025                        | 700               | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| m,p-Xylene                                | µg/L  | 83.6                          | NV                | < 1.0 U   | < 1.0 U                               | < 1.0 U                       | < 1.0 U                          | < 1.0 U                          | < 1.0 U                          | < 1.0 U                          |
| Methylene chloride                        | µg/L  | 1,699                         | 5                 | 7.0   | 4.3                                   | < 1.0 U                       | 1.9 J                            | 1.4 J                            | 1.1 J                            | 1.1 J                            |
| o-Xylene                                  | µg/L  | 83.6                          | NV                | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Styrene                                   | µg/L  | 5,987                         | 100               | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Tetrachloroethene                         | µg/L  | 180.7                         | 5                 | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Toluene                                   | µg/L  | 4,189                         | 10                | < 0.50 U  | < 0.50 U                              | < 0.50 U                      | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         | < 0.50 U                         |
| Trichloroethene                           | µg/L  | 181                           | 5                 | 6.8   | 9.5                                   | < 0.50 U                      | 6.8                              | 5.4                              | 6.5                              | 4.8                              |
| Vinyl chloride                            | µg/L  | 72                            | 2                 | 0.54 J  | 0.62 J                                | < 0.50 U                      | 0.49 J                           | 0.45 J                           | 0.52 J                           | < 0.50 U                         |
| <b>Anions (9056)</b>                      |       |                               |                   |   |                                       |                               |                                  |                                  |                                  |                                  |
| Chloride                                  | mg/L  | NV                            | NV                | NA  | NA                                    | NA                            | 425                              | 457                              | NA                               | NA                               |
| Sulfate                                   | mg/L  | NV                            | NV                | NA  | NA                                    | NA                            | 36.5                             | 27.8                             | NA                               | NA                               |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

NV - No Value

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

BIX - before ion exchange vessel

AIX - after ion exchange vessel

UI - estimated non-detect due to quality control issues and reported to the limit of detection

\*Discharged to Harrison Bayou

\*\*The biweekly effluent results for Methylene chloride and Trichloroethene (TCE) exceeded the screening criteria for the INF Pond on 11/26/19 and the monthly effluent result for TCE on 12/3/19. These samples were collected to evaluate the Ion Exchange Vessels ability to remove these contaminants and verify that the low level exceedances discharged to the INF Pond did not adversely affect the pond.

## GWTP Monthly Effluent Sampling - December 2019

| Location ID:<br>Sample Date:                       | Units | Daily Maximum<br>Conc | (INF pond) MCL | LH18/24-SP650_120319*<br>12/3/19  |
|--|-------|-----------------------|----------------|---|
| Location Description                               |       |                       |                | GWTP – Collected from a spigot on<br>the discharge of effluent TK-650.<br>Sampled monthly |
| <b>Volatile Organic Compounds (8260C)</b>          |       |                       |                |   |
| 1,1,1-Trichloroethane                              | µg/L  | 7,230                 | 200            | < 0.50 U  |
| 1,1,2-Trichloroethane                              | µg/L  | 216.9                 | 5              | < 0.50 U  |
| 1,1-Dichloroethane                                 | µg/L  | 14,032                | NV             | < 0.50 U  |
| 1,1-Dichloroethene                                 | µg/L  | 253                   | 7              | < 0.50 U  |
| 1,2-Dichloroethane                                 | µg/L  | 181                   | 5              | <b>1.4</b>  |
| 1,2-Dichloropropane                                | µg/L  | 5                     | 5              | < 0.50 U  |
| Acetone  | µg/L  | 2,395                 | NV             | < 1.0 U   |
| Benzene  | µg/L  | 181                   | 5              | < 0.50 U  |
| Carbon tetrachloride                               | µg/L  | 181                   | 5              | < 0.50 U  |
| Chlorobenzene                                      | µg/L  | 47,180                | 100            | < 0.50 U  |
| Chloroform   | µg/L  | 3,615                 | NV             | < 0.50 U  |
| cis-1,2-dichloroethene                             | µg/L  | NV                    | 70             | <b>46</b>   |
| Ethylbenzene                                       | µg/L  | 57,025                | 700            | < 0.50 U  |
| m,p-Xylene   | µg/L  | 83.6                  | NV             | < 1.0 U   |
| Methylene chloride                                 | µg/L  | 1,699                 | 5              | <b>4.1</b>  |
| o-Xylene   | µg/L  | 83.6                  | NV             | < 0.50 U  |
| Styrene  | µg/L  | 5,987                 | 100            | < 0.50 U  |
| Tetrachloroethene                                  | µg/L  | 180.7                 | 5              | < 0.50 U  |
| Toluene  | µg/L  | 4,189                 | 10             | < 0.50 U  |
| Trichloroethene                                    | µg/L  | 181                   | 5              | <b>9.3</b>  |
| Vinyl chloride                                     | µg/L  | 72                    | 2              | <b>0.65 J</b>   |
| <b>Metals (6020A)</b>                              |       |                       |                |   |
| Barium   | mg/L  | 2                     | 2              | <b>0.117 J</b>  |
| Lead   | mg/L  | 0.0046                | 0.015          | < 0.00100 UJ  |
| Selenium   | mg/L  | 0.012                 | 0.05           | < 0.00250 U   |
| Silver   | mg/L  | 0.003                 | 0.1            | < 0.000500 UJ   |
| <b>Hexavalent Chromium (7196A)</b>                 |       |                       |                |   |
| Hexavalent Chromium                                | mg/L  | 0.1244                | NV             | < 0.0100 U  |
| <b>Semi-Volatile Organic Compounds (8270D SIM)</b> |       |                       |                |   |
| 1,4-Dioxane  | µg/L  | 134.2                 | NV             | <b>20</b>   |

µg/L - micrograms per liter

mg/L - milligrams per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

UJ - estimated non-detect due to quality control issues and reported to the limit of detection

\*between the ion exchange vessels

NV - no value

discharged to INF pond

### GWTP Monthly Influent Sampling - December 2019

|                              |       |  |
|------------------------------|-------|--|
| Location ID:<br>Sample Date: | Units | LH18/24-SP140_120319<br>12/3/19  |
| Location Description         |       | GWTP – Collected from a spigot on the influent to TK-140. Sampled Monthly. |
| Metals (6020A)               |       |  |
| Selenium                     | mg/L  | 0.00126 J  |
| Silver                       | mg/L  | < 0.000500 U   |
| Hexavalent Chromium (7196A)  |       |  |
| Hexavalent Chromium          | mg/L  | < 0.0100 U   |
| Perchlorate (6850)           |       |  |
| Perchlorate                  | µg/L  | 11,000   |

mg/L - milligrams per liter

µg/L - micrograms per liter

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

## GWTP Quarterly Effluent Sampling - December 2019\*

| Location ID:<br>Sample Date:              | Units | Daily Maximum<br>Conc | (INF pond) MCL | LH18/24-SP650_121719<br>12/17/19   |
|---|-------|-----------------------|----------------|--|
| Location Description                      |       |                       |                | GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Quarterly. |
| <b>Oil and Grease (1664A)</b>             |       |                       |                |  |
| Oil & Grease                              | mg/L  | 15                    | NV             | < 1.00 U   |
| <b>Chemical Oxygen Demand (410.4)</b>     |       |                       |                |  |
| Chemical Oxygen Demand                    | mg/L  | 200                   | NV             | 22   |
| <b>Volatile Organic Compounds (8260C)</b> |       |                       |                |  |
| 1,1,1-Trichloroethane                     | µg/L  | 7,230                 | 200            | < 0.5 U  |
| 1,1,2-Trichloroethane                     | µg/L  | 216.9                 | 5              | < 0.5 U  |
| 1,1-Dichloroethane                        | µg/L  | 14,032                | NV             | < 0.5 U  |
| 1,1-Dichloroethene                        | µg/L  | 253                   | 7              | < 0.5 U  |
| 1,2-Dichloroethane                        | µg/L  | 181                   | 5              | 1.5  |
| 1,2-Dichloropropane                       | µg/L  | 5                     | 5              | < 0.5 U  |
| Acetone                                   | µg/L  | 2,395                 | NV             | < 1.0 U  |
| Benzene                                   | µg/L  | 181                   | 5              | < 0.5 U  |
| Carbon tetrachloride                      | µg/L  | 181                   | 5              | < 0.5 U  |
| Chlorobenzene                             | µg/L  | 47,180                | 100            | < 0.5 U  |
| Chloroform                                | µg/L  | 3,615                 | NV             | < 0.5 U  |
| cis-1,2-dichloroethene                    | mg/L  | NV                    | 70             | 39   |
| Ethylbenzene                              | µg/L  | 57,025                | 700            | < 0.5 U  |
| m,p-Xylene                                | µg/L  | 83.6                  | NV             | < 1.0 U  |
| Methylene chloride                        | µg/L  | 1,699                 | 5              | 1.7 J  |
| o-Xylene                                  | µg/L  | 83.6                  | NV             | < 0.5 U  |
| Styrene                                   | µg/L  | 5,987                 | 100            | < 0.5 U  |
| Tetrachloroethene                         | µg/L  | 180.7                 | 5              | < 0.5 U  |
| Toluene                                   | µg/L  | 4,189                 | 10             | < 0.5 U  |
| Trichloroethene                           | µg/L  | 181                   | 5              | 6.8  |
| Vinyl chloride                            | µg/L  | 72                    | 2              | 0.48 J   |
| <b>Metals (6020A)</b>                     |       |                       |                |  |
| Aluminum                                  | mg/L  | 1.644                 |                | 0.0194   |
| Antimony                                  | mg/L  | NV                    | 0.006          | < 0.000500 U   |
| Arsenic                                   | mg/L  | 0.722                 | 0.01           | 0.000634 J   |
| Barium                                    | mg/L  | 2                     | 2              | 0.0888   |
| Beryllium                                 | mg/L  | NV                    | 0.004          | < 0.000500 U   |
| Cadmium                                   | mg/L  | 0.0034                | 0.005          | < 0.000500 U   |
| Calcium                                   | mg/L  | NV                    | NV             | 7.99   |
| Chromium                                  | mg/L  | 0.752                 | 0.1            | 0.000428 J   |
| Cobalt                                    | mg/L  | 11.495                | NV             | 0.00149 J  |
| Iron                                      | mg/L  | 2.395                 | NV             | 0.108 J  |
| Lead                                      | mg/L  | 0.0046                | 0.015          | < 0.00100 U  |
| Magnesium                                 | mg/L  | NV                    | NV             | 24.0   |
| Manganese                                 | mg/L  | 15.494                | NV             | 0.104  |

|  |      |       |       |                  |
|--|------|-------|-------|------------------|
| Nickel   | mg/L | 0.184 | NV    | <b>0.00372 J</b> |
| Potassium  | mg/L | NV    | NV    | <b>1.29</b>      |
| Selenium   | mg/L | 0.012 | 0.05  | < 0.00250 U      |
| Silver   | mg/L | 0.003 | NV    | < 0.000500 U     |
| Sodium   | mg/L | NV    | NV    | <b>339</b>       |
| Thallium   | mg/L | NV    | NV    | < 0.000500 U     |
| Vanadium   | mg/L | 3.592 | NV    | < 0.00100 U      |
| Zinc   | mg/L | 0.31  | NV    | <b>0.0172</b>    |
| Mercury  | mg/L | NV    | 0.002 | < 0.000100 U     |
| <b>Anions (9056)</b>                               |      |       |       |                  |
| Chloride   | mg/L | NV    | NV    | <b>453</b>       |
| Sulfate  | mg/L | NV    | NV    | <b>28.8</b>      |
| <b>Semi-Volatile Organic Compounds (8270D SIM)</b> |      |       |       |                  |
| 1,4-Dioxane  | µg/L | 134.2 | NV    | <b>20.0</b>      |

µg/L - micrograms per liter

mg/L - milligrams per liter

J - estimated value between the detection limit and limit of quantitation and/or due to quality control issues

NV - No Value

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.

\*discharged to Harrison Bayou

## GWTP Quarterly Influent Sampling - December 2019

| Location ID:<br>Sample Date:       | Units | LH18/24-SP140_121719<br>12/17/19   |
|------------------------------------|-------|--|
| Location Description               |       | GWTP – Collected from a spigot on the influent to TK-140. Sampled Quarterly. |
| Oil and Grease (1664A)             |       |  |
| Oil & Grease                       | mg/L  | < 1.00 U   |
| Chemical Oxygen Demand (410.4)     |       |  |
| Chemical Oxygen Demand             | mg/L  | 15   |
| Perchlorate (6850)                 |       |  |
| Perchlorate                        | µg/L  | 14,000   |
| Volatile Organic Compounds (8260C) |       |  |
| 1,1,1,2-Tetrachloroethane          | µg/L  | < 10 U   |
| 1,1,1-Trichloroethane              | µg/L  | < 10 U   |
| 1,1,2,2-Tetrachloroethane          | µg/L  | < 10 U   |
| 1,1,2-Trichloroethane              | µg/L  | < 10 U   |
| 1,1-Dichloroethane                 | µg/L  | 8.5 J  |
| 1,1-Dichloroethene                 | µg/L  | < 10 U   |
| 1,1-Dichloropropene                | µg/L  | < 10 U   |
| 1,2,3-Trichlorobenzene             | µg/L  | < 10 UJ  |
| 1,2,3-Trichloropropane             | µg/L  | < 10 U   |
| 1,2,4-Trichlorobenzene             | µg/L  | < 10 U   |
| 1,2,4-Trimethylbenzene             | µg/L  | < 10 U   |
| 1,2-Dibromo-3-chloropropane        | µg/L  | < 10 U   |
| 1,2-Dibromoethane                  | µg/L  | < 10 U   |
| 1,2-Dichlorobenzene                | µg/L  | < 10 U   |
| 1,2-Dichloroethane                 | µg/L  | 43   |
| 1,2-Dichloropropane                | µg/L  | < 10 U   |
| 1,3,5-Trimethylbenzene             | µg/L  | < 10 U   |
| 1,3-Dichlorobenzene                | µg/L  | < 10 U   |
| 1,3-Dichloropropane                | µg/L  | < 10 U   |
| 1,4-Dichlorobenzene                | µg/L  | < 10 U   |
| 2,2-Dichloropropane                | µg/L  | < 10 U   |
| 2-Butanone                         | µg/L  | < 20 U   |
| 2-Chlorotoluene                    | µg/L  | < 10 U   |
| 2-Hexanone                         | µg/L  | < 20 U   |
| 4-Chlorotoluene                    | µg/L  | < 10 U   |
| 4-Isopropyltoluene                 | µg/L  | < 10 U   |
| 4-Methyl-2-pentanone               | µg/L  | < 20 U   |
| Acetone                            | µg/L  | < 20 U   |
| Benzene                            | µg/L  | < 10 U   |
| Bromobenzene                       | µg/L  | < 10 U   |
| Bromochloromethane                 | µg/L  | < 10 U   |
| Bromodichloromethane               | µg/L  | < 10 U   |

|                           |      |                   |
|---------------------------|------|-------------------|
| Bromoform                 | µg/L | < 10 U            |
| Bromomethane              | µg/L | < 10 U            |
| Carbon disulfide          | µg/L | < 20 U            |
| Carbon tetrachloride      | µg/L | < 10 U            |
| Chlorobenzene             | µg/L | < 10 U            |
| Chloroethane              | µg/L | < 10 U            |
| Chloroform                | µg/L | < 10 U            |
| Chloromethane             | µg/L | < 10 U            |
| cis-1,2-Dichloroethene    | µg/L | <b>3,200</b>      |
| cis-1,3-Dichloropropene   | µg/L | < 10 U            |
| Dibromochloromethane      | µg/L | < 10 U            |
| Dibromomethane            | µg/L | < 10 U            |
| Dichlorodifluoromethane   | µg/L | < 10 U            |
| Ethylbenzene              | µg/L | < 10 U            |
| Hexachlorobutadiene       | µg/L | < 10 U            |
| Isopropylbenzene          | µg/L | < 10 U            |
| m,p-Xylene                | µg/L | < 20 U            |
| Methylene chloride        | µg/L | <b>510</b>        |
| Naphthalene               | µg/L | < 10 U            |
| n-Butylbenzene            | µg/L | < 10 U            |
| n-Propylbenzene           | µg/L | < 10 U            |
| o-Xylene                  | µg/L | < 10 U            |
| sec-Butylbenzene          | µg/L | < 10 U            |
| Styrene                   | µg/L | < 10 U            |
| tert-Butylbenzene         | µg/L | < 10 U            |
| Tetrachloroethene         | µg/L | <b>35</b>         |
| Toluene                   | µg/L | < 10 U            |
| trans-1,2-Dichloroethene  | µg/L | <b>12 J</b>       |
| trans-1,3-Dichloropropene | µg/L | < 10 U            |
| Trichloroethene           | µg/L | <b>5,400</b>      |
| Trichlorofluoromethane    | µg/L | < 10 U            |
| Vinyl chloride            | µg/L | <b>130</b>        |
| <b>Metals (6020A)</b>     |      |                   |
| Aluminum                  | mg/L | <b>0.0275</b>     |
| Antimony                  | mg/L | < 0.000500 U      |
| Arsenic                   | mg/L | <b>0.000872 J</b> |
| Barium                    | mg/L | <b>0.766</b>      |
| Beryllium                 | mg/L | < 0.000500 U      |
| Cadmium                   | mg/L | <b>0.000223 J</b> |
| Calcium                   | mg/L | <b>44.3</b>       |
| Chromium                  | mg/L | <b>0.00121 J</b>  |
| Cobalt                    | mg/L | <b>0.00820</b>    |
| Iron                      | mg/L | <b>0.478</b>      |
| Lead                      | mg/L | < 0.00100 U       |
| Magnesium                 | mg/L | <b>34.2</b>       |
| Manganese                 | mg/L | <b>0.542</b>      |

|  |      |                   |
|--|------|-------------------|
| Nickel   | mg/L | <b>0.0146</b>     |
| Potassium  | mg/L | <b>1.21</b>       |
| Selenium   | mg/L | < 0.00250 U       |
| Silver   | mg/L | < 0.000500 U      |
| Sodium   | mg/L | <b>211</b>        |
| Thallium   | mg/L | <b>0.000326 J</b> |
| Vanadium   | mg/L | < 0.00100 U       |
| Zinc   | mg/L | <b>0.0549</b>     |
| Mercury  | mg/L | < 0.000100 U      |
| <b>Anions (9056)</b>                               |      |                   |
| Chloride   | mg/L | <b>446</b>        |
| Sulfate  | mg/L | <b>26.6</b>       |
| <b>Semi-Volatile Organic Compounds (8270D SIM)</b> |      |                   |
| 1,4-Dioxane  | µg/L | <b>20</b>         |

µg/L - micrograms per liter

mg/L - milligrams per liter

J -estimated value between the detection limit and limit of quantitation and/or due to quality control issues

U- Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection.



## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MSCL<br>PCL | AWD1_121319<br>12/13/19 | AWD3_121319<br>12/13/19 | AWD3_121319-a<br>12/13/19 | AWD4_121119<br>12/11/19 | 18CPTMW01SW_121319<br>12/13/19 | 18CPTMW03SW_121119<br>12/11/19 | 18CPTMW04_121719<br>12/17/19 | 18CPTMW04SW_121719<br>12/17/19 |
|---|-------|-----------------|-------------------------|-------------------------|---------------------------|-------------------------|--------------------------------|--------------------------------|------------------------------|--------------------------------|
| Lab Package                               |       |                 | HS19120844              | HS19120843              | HS19120843                | HS19120696              | HS19120844                     | HS19120702                     | HS19121036                   | HS19121036                     |
| Well ID                                   |       |                 | AWD-1                   | AWD-3                   | AWD-3                     | AWD-4                   | 18CPTMW01SW                    | 18CPTMW03SW                    | 18CPTMW04                    | 18CPTMW04SW                    |
| Aquifer Zone:                             |       |                 | Shallow                 | Shallow                 | Shallow                   | Shallow                 | Wilcox                         | Wilcox                         | Wilcox                       | Wilcox                         |
| <b>Perchlorate (6850)</b>                 |       |                 |                         |                         |                           |                         |                                |                                |                              |                                |
| Perchlorate                               | µg/L  | 17*             | 1.4 J                   | 32                      | 29                        | 410                     | < 2.0 U                        | 9.1                            | 520                          | 1.1 J                          |
| <b>Volatile Organic Compounds (8260C)</b> |       |                 |                         |                         |                           |                         |                                |                                |                              |                                |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110             | NA                      | < 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                     | µg/L  | 200             | NA                      | < 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                 | µg/L  | 14              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,1,2-Trichloroethane                     | µg/L  | 5               | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,1-Dichloroethane                        | µg/L  | 10,000          | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,1-Dichloroethene                        | µg/L  | 7               | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,1-Dichloropropene                       | µg/L  | 2.9             | NA                      | < 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                    | µg/L  | 310             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 UJ                       | < 0.5 U                        | < 0.5 UJ                     | < 0.5 UJ                       |
| 1,2,3-Trichloropropane                    | µg/L  | 0.041           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70              | NA                      | < 0.5 UJ                | < 0.5 UJ                  | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100           | NA                      | < 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               | µg/L  | 0.2             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,2-Dibromoethane                         | µg/L  | 0.05            | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,2-Dichlorobenzene                       | µg/L  | 600             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,2-Dichloroethane                        | µg/L  | 5               | NA                      | 1.5                     | 1.5                       | < 0.5 U                 | < 0.5 U                        | 1.2                            | 1.1                          | < 0.5 U                        |
| 1,2-Dichloropropane                       | µg/L  | 5               | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,3-Dichlorobenzene                       | µg/L  | 3,100           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,3-Dichloropropane                       | µg/L  | 29              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 1,4-Dichlorobenzene                       | µg/L  | 75              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 2,2-Dichloropropane                       | µg/L  | 42              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 2-Butanone                                | µg/L  | 61,000          | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | < 1.0 U                        | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| 2-Chlorotoluene                           | µg/L  | 2,000           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 2-Hexanone                                | µg/L  | 6,100           | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | < 1.0 U                        | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| 4-Chlorotoluene                           | µg/L  | 2,000           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| 4-Isopropyltoluene                        | µg/L  | 10,000          | NA                      | < 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                      | µg/L  | 8,200           | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | < 1.0 U                        | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| Acetone                                   | µg/L  | 92,000          | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | < 1.0 U                        | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| Benzene                                   | µg/L  | 5               | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | 3.6                            | 2.0                            | < 0.5 U                      | < 0.5 U                        |
| Bromobenzene                              | µg/L  | 2,000           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Bromochloromethane                        | µg/L  | 4,100           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Bromodichloromethane                      | µg/L  | 4.6             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Bromoform                                 | µg/L  | 36              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Bromomethane                              | µg/L  | 140             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Carbon disulfide                          | µg/L  | 10,000          | NA                      | < 1.0 UJ                | < 1.0 UJ                  | < 1.0 UJ                | < 1.0 UJ                       | < 1.0 UJ                       | < 1.0 U                      | < 1.0 U                        |
| Carbon tetrachloride                      | µg/L  | 5               | NA                      | 8.4                     | 8.5                       | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Chlorobenzene                             | µg/L  | 100             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Chloroethane                              | µg/L  | 41,000          | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Chloroform                                | µg/L  | 1,000           | NA                      | 0.97 J                  | 0.99 J                    | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | 0.84 J                       | < 0.5 U                        |
| Chloromethane                             | µg/L  | 220             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| cis-1,2-Dichloroethene                    | µg/L  | 70              | NA                      | 6.8                     | 6.9                       | < 0.5 U                 | 110                            | 8.1                            | 19                           | < 0.5 U                        |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Dibromochloromethane                      | µg/L  | 34              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Dibromomethane                            | µg/L  | 380             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Dichlorodifluoromethane                   | µg/L  | 20,000          | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Ethylbenzene                              | µg/L  | 700             | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Hexachlorobutadiene                       | µg/L  | 20              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Isopropylbenzene                          | µg/L  | 10,000          | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| m,p-Xylene                                | µg/L  | 10,000**        | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | 0.73 J                         | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| Methylene chloride                        | µg/L  | 5               | NA                      | < 1.0 U                 | < 1.0 U                   | < 1.0 U                 | 10                             | < 1.0 U                        | < 1.0 U                      | < 1.0 U                        |
| Naphthalene                               | µg/L  | 2,000           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| n-Butylbenzene                            | µg/L  | 4,100           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MS/CL<br>PCL | AWD1_121319<br>12/13/19 | AWD3_121319<br>12/13/19 | AWD3_121319-a<br>12/13/19 | AWD4_121119<br>12/11/19 | 18CPTMW01SW_121319<br>12/13/19 | 18CPTMW03SW_121119<br>12/11/19 | 18CPTMW04_121719<br>12/17/19 | 18CPTMW04SW_121719<br>12/17/19 |
|--------------------------------|-------|------------------|-------------------------|-------------------------|---------------------------|-------------------------|--------------------------------|--------------------------------|------------------------------|--------------------------------|
| n-Propylbenzene                | µg/L  | 4,100            | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| o-Xylene                       | µg/L  | 10,000**         | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | <b>0.57 J</b>                  | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| sec-Butylbenzene               | µg/L  | 4,100            | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Styrene                        | µg/L  | 100              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| tert-Butylbenzene              | µg/L  | 4,100            | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Tetrachloroethene              | µg/L  | 5                | NA                      | <b>1.1</b>              | <b>1.0</b>                | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Toluene                        | µg/L  | 1,000            | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | <b>2.2</b>                     | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| trans-1,2-Dichloroethene       | µg/L  | 100              | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | <b>0.60 J</b>                  | <b>0.66 J</b>                  | < 0.5 U                      | < 0.5 U                        |
| trans-1,3-Dichloropropene      | µg/L  | 29               | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Trichloroethene                | µg/L  | 5                | NA                      | <b>230</b>              | <b>220</b>                | <b>0.65 J</b>           | <b>64</b>                      | <b>13</b>                      | <b>660</b>                   | <b>0.82 J</b>                  |
| Trichlorofluoromethane         | µg/L  | 31,000           | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| Vinyl chloride                 | µg/L  | 2                | NA                      | < 0.5 U                 | < 0.5 U                   | < 0.5 U                 | < 0.5 U                        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                        |
| <b>Metals (6020A)</b>          |       |                  |                         |                         |                           |                         |                                |                                |                              |                                |
| Aluminum                       | mg/L  | 100              | <b>4.91</b>             | <b>0.164 J</b>          | <b>0.105 J</b>            | <b>0.692</b>            | 0.0105 UB                      | <b>0.0241</b>                  | NA                           | <b>0.0524</b>                  |
| Antimony                       | mg/L  | 0.006            | <b>0.00119 J</b>        | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            | < 0.000500 U                   | <b>0.000691 J</b>              | NA                           | < 0.000500 U                   |
| Arsenic                        | mg/L  | 0.01             | <b>0.0181</b>           | <b>0.000581 J</b>       | <b>0.000503 J</b>         | < 0.000500 U            | <b>0.0145</b>                  | <b>0.00162 J</b>               | NA                           | <b>0.00167 J</b>               |
| Barium                         | mg/L  | 2                | <b>0.359</b>            | <b>0.0350</b>           | <b>0.0351</b>             | <b>0.213</b>            | <b>1.20</b>                    | <b>0.156</b>                   | NA                           | <b>0.680</b>                   |
| Beryllium                      | mg/L  | 0.004            | <b>0.000427 J</b>       | < 0.000500 U            | < 0.000500 U              | <b>0.000204 J</b>       | < 0.000500 U                   | < 0.000500 U                   | NA                           | < 0.000500 U                   |
| Cadmium                        | mg/L  | 0.005            | < 0.000500 U            | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            | < 0.000500 U                   | < 0.000500 U                   | NA                           | < 0.000500 U                   |
| Calcium                        | mg/L  | NV               | <b>2.99</b>             | <b>0.856</b>            | <b>0.855</b>              | <b>7.56</b>             | <b>35.4</b>                    | <b>14.0</b>                    | NA                           | <b>24.2</b>                    |
| Chromium                       | mg/L  | 0.1              | <b>0.0162</b>           | <b>0.696</b>            | <b>0.638</b>              | <b>0.0998</b>           | <b>0.000961 J</b>              | <b>0.0174</b>                  | NA                           | <b>0.00722</b>                 |
| Cobalt                         | mg/L  | 6.1              | <b>0.00921</b>          | <b>0.00622</b>          | <b>0.00617</b>            | <b>0.00793</b>          | <b>0.000350 J</b>              | <b>0.00235 J</b>               | NA                           | <b>0.00212 J</b>               |
| Copper                         | mg/L  | 1.3              | <b>0.00380 J</b>        | <b>0.00578</b>          | <b>0.00553</b>            | <b>0.00868</b>          | < 0.00250 U                    | < 0.00250 U                    | NA                           | < 0.00250 U                    |
| Iron                           | mg/L  | NV               | <b>8.27</b>             | <b>2.32</b>             | <b>2.16</b>               | <b>2.45</b>             | <b>65.1</b>                    | 0.477 UB                       | NA                           | <b>4.45</b>                    |
| Lead                           | mg/L  | 0.015            | <b>0.00334 J</b>        | < 0.00100 U             | < 0.00100 U               | <b>0.000644 J</b>       | < 0.00100 U                    | < 0.00100 U                    | NA                           | < 0.00100 U                    |
| Magnesium                      | mg/L  | NV               | <b>3.68</b>             | <b>0.572</b>            | <b>0.554</b>              | <b>5.12</b>             | <b>24.4</b>                    | <b>9.84</b>                    | NA                           | <b>14.7</b>                    |
| Manganese                      | mg/L  | 1.1*             | <b>0.273</b>            | <b>0.0510</b>           | <b>0.0497</b>             | <b>0.0714</b>           | <b>0.666</b>                   | <b>0.0209</b>                  | NA                           | <b>0.196</b>                   |
| Nickel                         | mg/L  | 0.49*            | <b>0.0195</b>           | <b>0.341</b>            | <b>0.340</b>              | <b>0.417</b>            | <b>0.00104 J</b>               | <b>0.00808</b>                 | NA                           | <b>0.00408 J</b>               |
| Potassium                      | mg/L  | NV               | <b>3.30</b>             | <b>0.639</b>            | <b>0.624</b>              | <b>0.360</b>            | <b>13.0</b>                    | <b>234</b>                     | NA                           | <b>57.0</b>                    |
| Selenium                       | mg/L  | 0.05             | <b>0.00445 J</b>        | <b>0.00549</b>          | <b>0.00484 J</b>          | < 0.00250 U             | < 0.00250 U                    | < 0.00250 U                    | NA                           | < 0.00250 U                    |
| Silver                         | mg/L  | 0.51             | < 0.000500 U            | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            | < 0.000500 U                   | < 0.000500 U                   | NA                           | < 0.000500 U                   |
| Sodium                         | mg/L  | NV               | <b>105</b>              | <b>32.1</b>             | <b>31.3</b>               | <b>46.7</b>             | <b>122</b>                     | <b>278</b>                     | NA                           | <b>105</b>                     |
| Thallium                       | mg/L  | 0.002            | < 0.000500 U            | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            | < 0.000500 U                   | < 0.000500 U                   | NA                           | < 0.000500 U                   |
| Vanadium                       | mg/L  | 0.72             | <b>0.00878</b>          | <b>0.00278 J</b>        | <b>0.00272 J</b>          | <b>0.00331 J</b>        | < 0.00100 U                    | < 0.00100 U                    | NA                           | < 0.00100 U                    |
| Zinc                           | mg/L  | 31               | <b>0.0165</b>           | <b>0.00274 J</b>        | <b>0.00330 J</b>          | <b>0.00835</b>          | <b>0.00328 J</b>               | <b>0.00605</b>                 | NA                           | <b>0.0153</b>                  |
| Mercury                        | mg/L  | 0.002            | < 0.000100 U            | < 0.000100 U            | < 0.000100 U              | <b>0.0000530 J</b>      | < 0.000100 U                   | < 0.000100 U                   | NA                           | < 0.000100 U                   |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                  |                         |                         |                           |                         |                                |                                |                              |                                |
| 1,4-Dioxane                    | µg/L  | 9.1*             | < 0.010 U               | NA                      | NA                        | < 0.010 U               | <b>0.19</b>                    | <b>2.3</b>                     | <b>2.8</b>                   | <b>1.6</b>                     |

## Notes:

Blue highlighting indicates concentrations above the MCL/MS/CL

MCL/MS/CL - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

a - duplicate sample

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:       | Units | MCL/MSCL<br>PCL | 18CPTMW06_121119<br>12/11/19 | 18CPTMW07_121219<br>12/12/19 | 18CPTMW08SW_121319<br>12/13/19 | 18CPTMW08DW_121319<br>12/13/19 | 18CPTMW10SW_120619<br>12/06/19 | 18CPTMW10DW_120619<br>12/06/19 | 18CPTMW12SW_120619<br>12/06/19 |
|------------------------------------|-------|-----------------|------------------------------|------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Lab Package                        |       |                 | HS19120702                   | HS19120765                   | HS19120843                     | HS19120843                     | HS19120386                     | HS19120386                     | HS19120386                     |
| Well ID                            |       |                 | 18CPTMW06                    | 18CPTMW07                    | 18CPTMW08SW                    | 18CPTMW08DW                    | 18CPTMW10SW                    | 18CPTMW10DW                    | 18CPTMW12SW                    |
| Aquifer Zone:                      |       |                 | Wilcox                       | Wilcox                       | Wilcox                         | Wilcox                         | Wilcox                         | Wilcox                         | Wilcox                         |
| Perchlorate (6850)                 |       |                 |                              |                              |                                |                                |                                |                                |                                |
| Perchlorate                        | µg/L  | 17*             | < 2.0 U                      | < 2.0 U                      | 24,000                         | 310                            | < 2.0 U                        | 10                             | < 2.0 U                        |
| Volatile Organic Compounds (8260C) |       |                 |                              |                              |                                |                                |                                |                                |                                |
| 1,1,1,2-Tetrachloroethane          | µg/L  | 110             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1,1-Trichloroethane              | µg/L  | 200             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1,2,2-Tetrachloroethane          | µg/L  | 14              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1,2-Trichloroethane              | µg/L  | 5               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1-Dichloroethane                 | µg/L  | 10,000          | < 0.5 U                      | < 0.5 U                      | 3.7                            | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1-Dichloroethene                 | µg/L  | 7               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,1-Dichloropropene                | µg/L  | 2.9             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2,3-Trichlorobenzene             | µg/L  | 310             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2,3-Trichloropropane             | µg/L  | 0.041           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2,4-Trichlorobenzene             | µg/L  | 70              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2,4-Trimethylbenzene             | µg/L  | 5,100           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2-Dibromo-3-chloropropane        | µg/L  | 0.2             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2-Dibromoethane                  | µg/L  | 0.05            | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2-Dichlorobenzene                | µg/L  | 600             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2-Dichloroethane                 | µg/L  | 5               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,2-Dichloropropane                | µg/L  | 5               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,3,5-Trimethylbenzene             | µg/L  | 5,100           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,3-Dichlorobenzene                | µg/L  | 3,100           | < 0.5 U                      | < 0.5 U                      | 0.59 J                         | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,3-Dichloropropane                | µg/L  | 29              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 1,4-Dichlorobenzene                | µg/L  | 75              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 2,2-Dichloropropane                | µg/L  | 42              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 2-Butanone                         | µg/L  | 61,000          | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| 2-Chlorotoluene                    | µg/L  | 2,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 2-Hexanone                         | µg/L  | 6,100           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| 4-Chlorotoluene                    | µg/L  | 2,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 4-Isopropyltoluene                 | µg/L  | 10,000          | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| 4-Methyl-2-pentanone               | µg/L  | 8,200           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| Acetone                            | µg/L  | 92,000          | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| Benzene                            | µg/L  | 5               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Bromobenzene                       | µg/L  | 2,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Bromochloromethane                 | µg/L  | 4,100           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Bromodichloromethane               | µg/L  | 4.6             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Bromoform                          | µg/L  | 36              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Bromomethane                       | µg/L  | 140             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Carbon disulfide                   | µg/L  | 10,000          | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| Carbon tetrachloride               | µg/L  | 5               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Chlorobenzene                      | µg/L  | 100             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Chloroethane                       | µg/L  | 41,000          | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Chloroform                         | µg/L  | 1,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Chloromethane                      | µg/L  | 220             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| cis-1,2-Dichloroethene             | µg/L  | 70              | < 0.5 U                      | < 0.5 U                      | 11                             | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| cis-1,3-Dichloropropene            | µg/L  | 5.3             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Dibromochloromethane               | µg/L  | 34              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Dibromomethane                     | µg/L  | 380             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Dichlorodifluoromethane            | µg/L  | 20,000          | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Ethylbenzene                       | µg/L  | 700             | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Hexachlorobutadiene                | µg/L  | 20              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Isopropylbenzene                   | µg/L  | 10,000          | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| m,p-Xylene                         | µg/L  | 10,000**        | < 1.0 U                      | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| Methylene chloride                 | µg/L  | 5               | 1.4 J                        | < 1.0 U                      | < 1.0 U                        | NA                             | < 1.0 U                        | < 1.0 U                        | < 1.0 U                        |
| Naphthalene                        | µg/L  | 2,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| n-Butylbenzene                     | µg/L  | 4,100           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MSCL/<br>PCL | 18CPTMW06_121119<br>12/11/19 | 18CPTMW07_121219<br>12/12/19 | 18CPTMW08SW_121319<br>12/13/19 | 18CPTMW08DW_121319<br>12/13/19 | 18CPTMW10SW_120619<br>12/06/19 | 18CPTMW10DW_120619<br>12/06/19 | 18CPTMW12SW_120619<br>12/06/19 |
|--------------------------------|-------|------------------|------------------------------|------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| n-Propylbenzene                | µg/L  | 4,100            | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| o-Xylene                       | µg/L  | 10,000**         | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| sec-Butylbenzene               | µg/L  | 4,100            | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Styrene                        | µg/L  | 100              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| tert-Butylbenzene              | µg/L  | 4,100            | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Tetrachloroethene              | µg/L  | 5                | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Toluene                        | µg/L  | 1,000            | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| trans-1,2-Dichloroethene       | µg/L  | 100              | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| trans-1,3-Dichloropropene      | µg/L  | 29               | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Trichloroethene                | µg/L  | 5                | 1.3                          | < 0.5 U                      | 42                             | NA                             | 0.92 J                         | 1.4                            | 1.3                            |
| Trichlorofluoromethane         | µg/L  | 31,000           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                        | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| Vinyl chloride                 | µg/L  | 2                | < 0.5 U                      | < 0.5 U                      | 2.7                            | NA                             | < 0.5 U                        | < 0.5 U                        | < 0.5 U                        |
| <b>Metals (6020A)</b>          |       |                  |                              |                              |                                |                                |                                |                                |                                |
| Aluminum                       | mg/L  | 100              | NA                           | NA                           | NA                             | NA                             | NA                             | 0.0297 UB                      | 0.0145 UB                      |
| Antimony                       | mg/L  | 0.006            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000500 U                   | < 0.000500 U                   |
| Arsenic                        | mg/L  | 0.01             | NA                           | NA                           | NA                             | NA                             | NA                             | 0.00194 J                      | 0.000792 J                     |
| Barium                         | mg/L  | 2                | NA                           | NA                           | NA                             | NA                             | NA                             | 0.124                          | 0.815                          |
| Beryllium                      | mg/L  | 0.004            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000500 U                   | < 0.000500 U                   |
| Cadmium                        | mg/L  | 0.005            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000500 U                   | < 0.000500 U                   |
| Calcium                        | mg/L  | NV               | NA                           | NA                           | NA                             | NA                             | NA                             | 10.5                           | 63.3                           |
| Chromium                       | mg/L  | 0.1              | NA                           | NA                           | NA                             | NA                             | NA                             | 0.00929                        | 0.00725                        |
| Cobalt                         | mg/L  | 6.1              | NA                           | NA                           | NA                             | NA                             | NA                             | 0.000146 J                     | 0.00232 J                      |
| Copper                         | mg/L  | 1.3              | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.0250 U                     | < 0.00250 U                    |
| Iron                           | mg/L  | NV               | NA                           | NA                           | NA                             | NA                             | NA                             | 1.23                           | 0.776                          |
| Lead                           | mg/L  | 0.015            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.00100 U                    | < 0.00100 U                    |
| Magnesium                      | mg/L  | NV               | NA                           | NA                           | NA                             | NA                             | NA                             | 4.55                           | 35.2                           |
| Manganese                      | mg/L  | 1.1*             | NA                           | NA                           | NA                             | NA                             | NA                             | 0.0295                         | 0.379                          |
| Nickel                         | mg/L  | 0.49*            | NA                           | NA                           | NA                             | NA                             | NA                             | 0.00120 J                      | 0.00624                        |
| Potassium                      | mg/L  | NV               | NA                           | NA                           | NA                             | NA                             | NA                             | 85.7                           | 41.3                           |
| Selenium                       | mg/L  | 0.05             | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.00250 U                    | < 0.00250 U                    |
| Silver                         | mg/L  | 0.51             | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000500 U                   | < 0.000500 U                   |
| Sodium                         | mg/L  | NV               | NA                           | NA                           | NA                             | NA                             | NA                             | 179                            | 232                            |
| Thallium                       | mg/L  | 0.002            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000500 U                   | < 0.000500 U                   |
| Vanadium                       | mg/L  | 0.72             | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.00100 U                    | < 0.00100 U                    |
| Zinc                           | mg/L  | 31               | NA                           | NA                           | NA                             | NA                             | NA                             | 0.00373 J                      | 0.0122                         |
| Mercury                        | mg/L  | 0.002            | NA                           | NA                           | NA                             | NA                             | NA                             | < 0.000100 U                   | < 0.000100 U                   |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                  |                              |                              |                                |                                |                                |                                |                                |
| 1,4-Dioxane                    | µg/L  | 9.1*             | 0.055                        | 1.3                          | 3                              | 0.31                           | < 0.010 U                      | NA                             | 0.14                           |

## Notes:

Blue highlighting indicates concentrations above the MCL/MSCL/PCL

MCL/MSCL - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MSCL<br>PCL | 18CPTMW12DW_120619<br>12/06/19 | 18CPTMW14_120919<br>12/09/19 | 18CPTMW15_121119<br>12/11/19 | 18CPTMW16_121319<br>12/13/19 | 18CPTMW18_121119<br>12/11/19 | 18CPTMW19_121119<br>12/11/19 | 18CPTMW22R_120519<br>12/05/19 | 18CPTMW22SW_120519<br>12/05/19 |
|---|-------|-----------------|--------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------------|
| Lab Package                               |       |                 | HS19120386                     | HS19120544                   | HS19120696                   | HS19120843                   | HS19120696                   | HS19120696                   | HS19120354                    | HS19120354                     |
| Well ID                                   |       |                 | 18CPTMW12DW                    | 18CPTMW14                    | 18CPTMW15                    | 18CPTMW16                    | 18CPTMW18                    | 18CPTMW19                    | 18CPTMW22R                    | 18CPTMW22SW                    |
| Aquifer Zone:                             |       |                 | Wilcox                         | Shallow                      | Shallow                      | Shallow                      | Shallow                      | Shallow                      | Shallow                       | Wilcox                         |
| <b>Perchlorate (6850)</b>                 |       |                 |                                |                              |                              |                              |                              |                              |                               |                                |
| Perchlorate                               | µg/L  | 17*             | < 2.0 U                        | 2,600                        | 2.5 J                        | < 2.0 U                      | < 2.0 U                      | 27                           | < 2.0 U                       | 33                             |
| <b>Volatile Organic Compounds (8260C)</b> |       |                 |                                |                              |                              |                              |                              |                              |                               |                                |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1,1-Trichloroethane                     | µg/L  | 200             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1,2,2-Tetrachloroethane                 | µg/L  | 14              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1,2-Trichloroethane                     | µg/L  | 5               | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1-Dichloroethane                        | µg/L  | 10,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1-Dichloroethene                        | µg/L  | 7               | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,1-Dichloropropene                       | µg/L  | 2.9             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2,3-Trichlorobenzene                    | µg/L  | 310             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2,3-Trichloropropane                    | µg/L  | 0.041           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2-Dibromo-3-chloropropane               | µg/L  | 0.2             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2-Dibromoethane                         | µg/L  | 0.05            | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2-Dichlorobenzene                       | µg/L  | 600             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2-Dichloroethane                        | µg/L  | 5               | < 0.5 U                        | 3.3                          | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,2-Dichloropropane                       | µg/L  | 5               | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,3-Dichlorobenzene                       | µg/L  | 3,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,3-Dichloropropane                       | µg/L  | 29              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 1,4-Dichlorobenzene                       | µg/L  | 75              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 2,2-Dichloropropane                       | µg/L  | 42              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 2-Butanone                                | µg/L  | 61,000          | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| 2-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 2-Hexanone                                | µg/L  | 6,100           | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| 4-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 4-Isopropyltoluene                        | µg/L  | 10,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| 4-Methyl-2-pentanone                      | µg/L  | 8,200           | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| Acetone                                   | µg/L  | 92,000          | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| Benzene                                   | µg/L  | 5               | < 0.5 U                        | 2.6                          | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Bromobenzene                              | µg/L  | 2,000           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Bromochloromethane                        | µg/L  | 4,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Bromodichloromethane                      | µg/L  | 4.6             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Bromoform                                 | µg/L  | 36              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Bromomethane                              | µg/L  | 140             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Carbon disulfide                          | µg/L  | 10,000          | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| Carbon tetrachloride                      | µg/L  | 5               | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Chlorobenzene                             | µg/L  | 100             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Chloroethane                              | µg/L  | 41,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Chloroform                                | µg/L  | 1,000           | < 0.5 U                        | 11                           | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Chloromethane                             | µg/L  | 220             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| cis-1,2-Dichloroethene                    | µg/L  | 70              | < 0.5 U                        | 22                           | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Dibromochloromethane                      | µg/L  | 34              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Dibromomethane                            | µg/L  | 380             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Dichlorodifluoromethane                   | µg/L  | 20,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Ethylbenzene                              | µg/L  | 700             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Hexachlorobutadiene                       | µg/L  | 20              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Isopropylbenzene                          | µg/L  | 10,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| m,p-Xylene                                | µg/L  | 10,000**        | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| Methylene chloride                        | µg/L  | 5               | < 1.0 U                        | < 1.0 U                      | < 1.0 U                      | NA                           | < 1.0 U                      | < 1.0 U                      | < 1.0 U                       | < 1.0 U                        |
| Naphthalene                               | µg/L  | 2,000           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| n-Butylbenzene                            | µg/L  | 4,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MSC/<br>PCL | 18CPTMW12DW_120619<br>12/06/19 | 18CPTMW14_120919<br>12/09/19 | 18CPTMW15_121119<br>12/11/19 | 18CPTMW16_121319<br>12/13/19 | 18CPTMW18_121119<br>12/11/19 | 18CPTMW19_121119<br>12/11/19 | 18CPTMW22R_120519<br>12/05/19 | 18CPTMW22SW_120519<br>12/05/19 |
|--------------------------------|-------|-----------------|--------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------------------------------|--------------------------------|
| n-Propylbenzene                | µg/L  | 4,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| o-Xylene                       | µg/L  | 10,000**        | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| sec-Butylbenzene               | µg/L  | 4,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Styrene                        | µg/L  | 100             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| tert-Butylbenzene              | µg/L  | 4,100           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Tetrachloroethene              | µg/L  | 5               | < 0.5 U                        | 1.5                          | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Toluene                        | µg/L  | 1,000           | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| trans-1,2-Dichloroethene       | µg/L  | 100             | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| trans-1,3-Dichloropropene      | µg/L  | 29              | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Trichloroethene                | µg/L  | 5               | < 0.5 U                        | 970                          | 1.7                          | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | 1.5                            |
| Trichlorofluoromethane         | µg/L  | 31,000          | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| Vinyl chloride                 | µg/L  | 2               | < 0.5 U                        | < 0.5 U                      | < 0.5 U                      | NA                           | < 0.5 U                      | < 0.5 U                      | < 0.5 U                       | < 0.5 U                        |
| <b>Metals (6020A)</b>          |       |                 |                                |                              |                              |                              |                              |                              |                               |                                |
| Aluminum                       | mg/L  | 100             | 0.0121 UB                      | 0.125                        | NA                           | NA                           | 0.0128 UB                    | NA                           | 22.4                          | 0.0584                         |
| Antimony                       | mg/L  | 0.006           | < 0.000500 U                   | < 0.000500 U                 | NA                           | NA                           | < 0.000500 U                 | NA                           | < 0.000500 U                  | < 0.000500 U                   |
| Arsenic                        | mg/L  | 0.01            | 0.00304 J                      | 0.00169 J                    | NA                           | NA                           | 0.00125 J                    | NA                           | 0.000937 J                    | 0.00197 J                      |
| Barium                         | mg/L  | 2               | 0.0892                         | 5.74                         | NA                           | NA                           | 0.686                        | NA                           | 0.0563                        | 0.0995                         |
| Beryllium                      | mg/L  | 0.004           | < 0.000500 U                   | < 0.000500 U                 | NA                           | NA                           | < 0.000500 U                 | NA                           | 0.000311 J                    | < 0.000500 U                   |
| Cadmium                        | mg/L  | 0.005           | < 0.000500 U                   | 0.000245 J                   | NA                           | NA                           | 0.000346 J                   | NA                           | < 0.000500 U                  | < 0.000500 U                   |
| Calcium                        | mg/L  | NV              | 6.13                           | 486                          | NA                           | NA                           | 241                          | NA                           | 0.579                         | 13.4                           |
| Chromium                       | mg/L  | 0.1             | 0.00294 J                      | 0.00510                      | NA                           | NA                           | 0.00161 J                    | NA                           | 0.00195 J                     | 0.0100                         |
| Cobalt                         | mg/L  | 6.1             | < 0.000500 U                   | 0.00966                      | NA                           | NA                           | 0.0159                       | NA                           | 0.00610                       | < 0.000500 U                   |
| Copper                         | mg/L  | 1.3             | < 0.00250 U                    | < 0.002500 U                 | NA                           | NA                           | < 0.00250 U                  | NA                           | 0.00200 J                     | < 0.00250 U                    |
| Iron                           | mg/L  | NV              | 0.873                          | 0.926                        | NA                           | NA                           | 0.802 UB                     | NA                           | 2.03                          | 0.0392 J                       |
| Lead                           | mg/L  | 0.015           | < 0.00500                      | < 0.00100 U                  | NA                           | NA                           | < 0.00100 U                  | NA                           | 0.00129 J                     | < 0.00100 U                    |
| Magnesium                      | mg/L  | NV              | 3.74                           | 130                          | NA                           | NA                           | 183                          | NA                           | 0.689                         | 4.52                           |
| Manganese                      | mg/L  | 1.1*            | 0.0237                         | 0.514                        | NA                           | NA                           | 2.03                         | NA                           | 0.0484                        | 0.0157                         |
| Nickel                         | mg/L  | 0.49*           | < 0.00100 U                    | 0.00637                      | NA                           | NA                           | 0.0148                       | NA                           | 0.00260 J                     | 0.000611 J                     |
| Potassium                      | mg/L  | NV              | 70.8                           | 15.6                         | NA                           | NA                           | 2.99                         | NA                           | 0.265                         | 281                            |
| Selenium                       | mg/L  | 0.05            | < 0.00250 U                    | < 0.002500 U                 | NA                           | NA                           | < 0.00250 U                  | NA                           | < 0.00250 U                   | < 0.00250 U                    |
| Silver                         | mg/L  | 0.51            | < 0.000500 U                   | < 0.000500 U                 | NA                           | NA                           | < 0.000500 U                 | NA                           | < 0.000500 U                  | < 0.000500 U                   |
| Sodium                         | mg/L  | NV              | 163                            | 567                          | NA                           | NA                           | 667                          | NA                           | 18.3                          | 280                            |
| Thallium                       | mg/L  | 0.002           | < 0.000500 U                   | < 0.000500 U                 | NA                           | NA                           | < 0.000500 U                 | NA                           | 0.000661 J                    | < 0.000500 U                   |
| Vanadium                       | mg/L  | 0.72            | < 0.00100 U                    | 0.000939 J                   | NA                           | NA                           | 0.00113 J                    | NA                           | 0.00386 J                     | 0.000853 J                     |
| Zinc                           | mg/L  | 31              | < 0.00250 U                    | 0.00617                      | NA                           | NA                           | 0.0270                       | NA                           | 0.00834                       | 0.0139                         |
| Mercury                        | mg/L  | 0.002           | < 0.000100 U                   | < 0.000100 U                 | NA                           | NA                           | < 0.000100 U                 | NA                           | < 0.000100 U                  | < 0.000100 U                   |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                 |                                |                              |                              |                              |                              |                              |                               |                                |
| 1,4-Dioxane                    | µg/L  | 9.1*            | 0.36                           | 0.22                         | < 0.010 U                    | 0.18                         | NA                           | < 0.010 U                    | < 0.010 U                     | 2.5                            |

## Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MS/CL | 18CPTMW23_120919<br>12/09/19 | 18CPTMW24_121219<br>12/12/19 | 18WW02_120919<br>12/09/19 | 18WW06_120919<br>12/09/19 | 18WW08_121119<br>12/11/19 | 18WW10_120919<br>12/09/19 | 18WW17_120619<br>12/06/19 | 18WW22_121219<br>12/12/19 | 18WW22_121219_a<br>12/12/19 |
|---|-------|-----------|------------------------------|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-----------------------------|
| Lab Package                               |       |           | HS19120544                   | HS19120765                   | HS19120544                | HS19120544                | HS19120696                | HS19120544                | HS19120386                | HS19120765                | HS19120765                  |
| Well ID                                   |       |           | 18CPTMW23                    | 18CPTMW24                    | 18WW02                    | 18WW06                    | 18WW08                    | 18WW10                    | 18WW17                    | 18WW22                    | 18WW22                      |
| Aquifer Zone:                             |       |           | Shallow                      | Shallow                      | Wilcox                    | Wilcox                    | Shallow                   | Shallow                   | Wilcox                    | Shallow                   | Shallow                     |
| <b>Perchlorate (6850)</b>                 |       |           |                              |                              |                           |                           |                           |                           |                           |                           |                             |
| Perchlorate                               | µg/L  | 17*       | 73                           | 11 J                         | < 2.0 U                   | < 2.0 U                   | 3,200                     | < 2.0 U                   | 74,000                    | < 2.0 U                   | < 2.0 U                     |
| <b>Volatile Organic Compounds (8260C)</b> |       |           |                              |                              |                           |                           |                           |                           |                           |                           |                             |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110       | < 5.0 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                     | µg/L  | 200       | < 5.0 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                 | µg/L  | 14        | < 5.0 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-Trichloroethane                     | µg/L  | 5         | < 5.0 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-Dichloroethane                        | µg/L  | 10,000    | < 5.0 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-Dichloroethene                        | µg/L  | 7         | < 5.0 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-Dichloropropene                       | µg/L  | 2.9       | < 5.0 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                    | µg/L  | 310       | < 2.5 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-Trichloropropane                    | µg/L  | 0.041     | < 5.0 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                     |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70        | < 5.0 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                     |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100     | < 5.0 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               | µg/L  | 0.2       | < 5.0 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-Dibromoethane                         | µg/L  | 0.05      | < 5.0 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                       | µg/L  | 600       | < 5.0 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-Dichloroethane                        | µg/L  | 5         | 140                          | < 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-Dichloropropane                       | µg/L  | 5         | < 5.0 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                     |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100     | < 5.0 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                       | µg/L  | 3,100     | < 5.0 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                       | µg/L  | 29        | < 5.0 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                     |
| 1,4-Dichlorobenzene                       | µg/L  | 75        | < 5.0 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                     |
| 2,2-Dichloropropane                       | µg/L  | 42        | < 5.0 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                                | µg/L  | 61,000    | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| 2-Chlorotoluene                           | µg/L  | 2,000     | < 5.0 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-Hexanone                                | µg/L  | 6,100     | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| 4-Chlorotoluene                           | µg/L  | 2,000     | < 5.0 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-Isopropyltoluene                        | µg/L  | 10,000    | < 5.0 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                      | µg/L  | 8,200     | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| Acetone                                   | µg/L  | 92,000    | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| Benzene                                   | µg/L  | 5         | < 5.0 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                     |
| Bromobenzene                              | µg/L  | 2,000     | < 5.0 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                     |
| Bromochloromethane                        | µg/L  | 4,100     | < 5.0 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                     |
| Bromodichloromethane                      | µg/L  | 4.6       | < 5.0 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                                 | µg/L  | 36        | < 5.0 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                     |
| Bromomethane                              | µg/L  | 140       | < 5.0 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                     |
| Carbon disulfide                          | µg/L  | 10,000    | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| Carbon tetrachloride                      | µg/L  | 5         | < 5.0 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                             | µg/L  | 100       | < 5.0 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                     |
| Chloroethane                              | µg/L  | 41,000    | < 5.0 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                     |
| Chloroform                                | µg/L  | 1,000     | < 5.0 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                     |
| Chloromethane                             | µg/L  | 220       | < 5.0 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                     |
| cis-1,2-Dichloroethene                    | µg/L  | 70        | 220                          | 26                           | < 0.5 U                   | < 0.5 U                   | 1.3                       | < 0.5 U                   | 0.74 J                    | < 0.5 U                   | < 0.5 U                     |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3       | < 5.0 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                      | µg/L  | 34        | < 5.0 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                            | µg/L  | 380       | < 5.0 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                   | µg/L  | 20,000    | < 5.0 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                              | µg/L  | 700       | < 5.0 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                       | µg/L  | 20        | < 5.0 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                          | µg/L  | 10,000    | < 5.0 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                                | µg/L  | 10,000**  | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| Methylene chloride                        | µg/L  | 5         | < 1.0 U                      | < 1.0 U                      | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                   | < 1.0 U                     |
| Naphthalene                               | µg/L  | 2,000     | < 5.0 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-Butylbenzene                            | µg/L  | 4,100     | < 5.0 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-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MSC/<br>PCL | 18CPTMW23_120919<br>12/09/19 | 18CPTMW24_121219<br>12/12/19 | 18WW02_120919<br>12/09/19 | 18WW06_120919<br>12/09/19 | 18WW08_121119<br>12/11/19 | 18WW10_120919<br>12/09/19 | 18WW17_120619<br>12/06/19 | 18WW22_121219<br>12/12/19 | 18WW22_121219_a<br>12/12/19 |
|--------------------------------|-------|-----------------|------------------------------|------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-----------------------------|
| n-Propylbenzene                | µg/L  | 4,100           | < 5.0 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                     |
| o-Xylene                       | µg/L  | 10,000**        | < 5.0 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               | µg/L  | 4,100           | < 5.0 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                        | µg/L  | 100             | < 5.0 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                     |
| tert-Butylbenzene              | µg/L  | 4,100           | < 5.0 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              | µg/L  | 5               | < 5.0 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                        | µg/L  | 1,000           | < 5.0 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       | µg/L  | 100             | < 5.0 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      | µg/L  | 29              | < 5.0 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                     |
| Trichloroethene                | µg/L  | 5               | <b>2,800</b>                 | <b>8.8</b>                   | < 0.5 U                   | < 0.5 U                   | <b>3.2</b>                | < 0.5 U                   | <b>39</b>                 | < 0.5 U                   | < 0.5 U                     |
| Trichlorofluoromethane         | µg/L  | 31,000          | < 5.0 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                 | µg/L  | 2               | < 5.0 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                     |
| <b>Metals (6020A)</b>          |       |                 |                              |                              |                           |                           |                           |                           |                           |                           |                             |
| Aluminum                       | mg/L  | 100             | NA                           | 0.00631 UB                   | <b>0.268</b>              | NA                        | NA                        | NA                        | 0.00775 UB                | <b>0.537</b>              | <b>0.548</b>                |
| Antimony                       | mg/L  | 0.006           | NA                           | < 0.000500 U                 | < 0.000500 U              | NA                        | NA                        | NA                        | < 0.000500 U              | <b>0.000417 J</b>         | < 0.000500 U                |
| Arsenic                        | mg/L  | 0.01            | NA                           | <b>0.00791</b>               | <b>0.000627 J</b>         | NA                        | NA                        | NA                        | <b>0.000411 J</b>         | <b>0.00476 J</b>          | <b>0.00499 J</b>            |
| Barium                         | mg/L  | 2               | NA                           | <b>11.7</b>                  | <b>0.0407</b>             | NA                        | NA                        | NA                        | <b>3.28</b>               | <b>0.0862</b>             | <b>0.0898</b>               |
| Beryllium                      | mg/L  | 0.004           | NA                           | < 0.000500 U                 | < 0.000500 U              | NA                        | NA                        | NA                        | < 0.000500 U              | < 0.000500 U              | < 0.000500 U                |
| Cadmium                        | mg/L  | 0.005           | NA                           | < 0.000500 U                 | < 0.000500 U              | NA                        | NA                        | NA                        | <b>0.000392 J</b>         | < 0.000500 U              | < 0.000500 U                |
| Calcium                        | mg/L  | NV              | NA                           | <b>427</b>                   | <b>6.86</b>               | NA                        | NA                        | NA                        | <b>326</b>                | <b>22.8</b>               | <b>23.7</b>                 |
| Chromium                       | mg/L  | 0.1             | NA                           | <b>0.000465 J</b>            | <b>0.0104</b>             | NA                        | NA                        | NA                        | <b>0.0411</b>             | <b>0.0309</b>             | <b>0.0318</b>               |
| Cobalt                         | mg/L  | 6.1             | NA                           | <b>0.00358 J</b>             | <b>0.000280 J</b>         | NA                        | NA                        | NA                        | <b>0.00213 J</b>          | <b>0.000444 J</b>         | <b>0.000409 J</b>           |
| Copper                         | mg/L  | 1.3             | NA                           | < 0.00250 U                  | <b>0.00499 J</b>          | NA                        | NA                        | NA                        | <b>0.00515</b>            | <b>0.00117 J</b>          | <b>0.00104 J</b>            |
| Iron                           | mg/L  | NV              | NA                           | <b>8.69</b>                  | <b>1.87</b>               | NA                        | NA                        | NA                        | <b>0.548</b>              | 0.241 UB                  | 0.0233 UB                   |
| Lead                           | mg/L  | 0.015           | NA                           | < 0.00100 U                  | <b>0.000841 J</b>         | NA                        | NA                        | NA                        | < 0.00100 U               | < 0.00100 U               | < 0.00100 U                 |
| Magnesium                      | mg/L  | NV              | NA                           | <b>286</b>                   | <b>1.22</b>               | NA                        | NA                        | NA                        | <b>215</b>                | <b>0.198 J</b>            | <b>0.201</b>                |
| Manganese                      | mg/L  | 1.1*            | NA                           | <b>0.668</b>                 | <b>0.0860</b>             | NA                        | NA                        | NA                        | <b>0.0461</b>             | 0.00292 UB                | 0.00125 UB                  |
| Nickel                         | mg/L  | 0.49*           | NA                           | <b>0.00536</b>               | <b>0.00775</b>            | NA                        | NA                        | NA                        | <b>0.134</b>              | < 0.00100 U               | < 0.00100 U                 |
| Potassium                      | mg/L  | NV              | NA                           | <b>3.19</b>                  | <b>1.78</b>               | NA                        | NA                        | NA                        | <b>1.55</b>               | <b>6.11</b>               | <b>6.33</b>                 |
| Selenium                       | mg/L  | 0.05            | NA                           | < 0.00250 U                  | < 0.00250 U               | NA                        | NA                        | NA                        | <b>0.00236 J</b>          | <b>0.00124 J</b>          | <b>0.00184 J</b>            |
| Silver                         | mg/L  | 0.51            | NA                           | < 0.000500 U                 | < 0.000500 U              | NA                        | NA                        | NA                        | < 0.000500 U              | < 0.000500 U              | < 0.000500 U                |
| Sodium                         | mg/L  | NV              | NA                           | <b>1120</b>                  | <b>23.7</b>               | NA                        | NA                        | NA                        | <b>1060</b>               | <b>59.9</b>               | <b>62.5</b>                 |
| Thallium                       | mg/L  | 0.002           | NA                           | < 0.000500 U                 | < 0.000500 U              | NA                        | NA                        | NA                        | < 0.000500 U              | < 0.000500 U              | < 0.000500 U                |
| Vanadium                       | mg/L  | 0.72            | NA                           | <b>0.00122 J</b>             | <b>0.00222 J</b>          | NA                        | NA                        | NA                        | <b>0.00186 J</b>          | <b>0.0458</b>             | <b>0.0483</b>               |
| Zinc                           | mg/L  | 31              | NA                           | <b>0.00658</b>               | <b>0.00466 J</b>          | NA                        | NA                        | NA                        | <b>0.0183</b>             | < 0.00250 U               | < 0.00250 U                 |
| Mercury                        | mg/L  | 0.002           | NA                           | < 0.000100 U                 | < 0.000100 U              | NA                        | NA                        | NA                        | < 0.000100 U              | < 0.000100 U              | < 0.000200                  |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                 |                              |                              |                           |                           |                           |                           |                           |                           |                             |
| 1,4-Dioxane                    | µg/L  | 9.1*            | <b>15</b>                    | <b>1.3</b>                   | < 0.010 U                 | < 0.010 U                 | <b>0.12</b>               | < 0.010 U                 | NA                        | <b>0.92</b>               | <b>0.9</b>                  |

## Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample



## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MSC/<br>PCL | 18WW24_121119<br>12/11/19 | CO3_121119<br>12/11/19 | CO8_121219<br>12/12/19 | CO9_121719<br>12/17/19 | MW2_121319<br>12/13/19 | MW2_121319-a<br>12/13/19 | MW3_121219<br>12/12/19 | MW5_121319<br>12/13/19 | MW7_120619<br>12/06/19 | MW8_120519<br>12/05/19 | MW9_120519<br>12/05/19 |
|---|-------|-----------------|---------------------------|------------------------|------------------------|------------------------|------------------------|--------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Lab Package                               |       |                 | HS19120696                | HS19120696             | HS19120765             | HS19121036             | HS19120844             | HS19120844               | HS19120765             | HS19120843             | HS19120386             | HS19120354             | HS19120354             |
| Well ID                                   |       |                 | 18WW24                    | C-03                   | C-08                   | C-09                   | MW-2                   | MW-2                     | MW-3                   | MW-5                   | MW-7                   | MW-8                   | MW-9                   |
| Aquifer Zone:                             |       |                 | Shallow                   | Wilcox                 | Shallow                | Shallow                | Shallow                | Shallow                  | Shallow                | Shallow                | Shallow                | Shallow                | Shallow                |
| <b>Perchlorate (6850)</b>                 |       |                 |                           |                        |                        |                        |                        |                          |                        |                        |                        |                        |                        |
| Perchlorate                               | µg/L  | 17*             | < 2.0 U                   | 15                     | < 2.0 U                | 1.5 J                  | < 2.0 U                | < 2.0 U                  | 15,000                 | 32,000                 | 25,000                 | 4,100                  | 320                    |
| <b>Volatile Organic Compounds (8260C)</b> |       |                 |                           |                        |                        |                        |                        |                          |                        |                        |                        |                        |                        |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,1,1-Trichloroethane                     | µg/L  | 200             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,1,2,2-Tetrachloroethane                 | µg/L  | 14              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,1,2-Trichloroethane                     | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,1-Dichloroethane                        | µg/L  | 10,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | 21 J                   | < 25 U                   | 4.3                    | 3.0                    | 0.49 J                 | < 0.5 U                | 0.52 J                 |
| 1,1-Dichloroethene                        | µg/L  | 7               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | 83                     | 70                       | < 0.5 U                | < 0.5 U                | 14                     | < 0.5 U                | 1.5                    |
| 1,1-Dichloropropene                       | µg/L  | 2.9             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2,3-Trichlorobenzene                    | µg/L  | 310             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | < 25 UJ                | < 25 UJ                  | < 0.5 U                | < 0.5 UJ               | < 0.5 UJ               | < 0.5 U                | < 0.5 U                |
| 1,2,3-Trichloropropane                    | µg/L  | 0.041           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2-Dibromo-3-chloropropane               | µg/L  | 0.2             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2-Dibromoethane                         | µg/L  | 0.05            | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2-Dichlorobenzene                       | µg/L  | 600             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,2-Dichloroethane                        | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | 30                     | 1.7                    | < 0.5 U                |
| 1,2-Dichloropropane                       | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,3-Dichlorobenzene                       | µg/L  | 3,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,3-Dichloropropane                       | µg/L  | 29              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 1,4-Dichlorobenzene                       | µg/L  | 75              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 2,2-Dichloropropane                       | µg/L  | 42              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 2-Butanone                                | µg/L  | 61,000          | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 50 U                 | < 50 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| 2-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 2-Hexanone                                | µg/L  | 6,100           | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 50 U                 | < 50 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| 4-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 4-Isopropyltoluene                        | µg/L  | 10,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| 4-Methyl-2-pentanone                      | µg/L  | 8,200           | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 50 U                 | < 50 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| Acetone                                   | µg/L  | 92,000          | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 50 U                 | < 50 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| Benzene                                   | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | 6.3                    | < 0.5 U                | < 0.5 U                |
| Bromobenzene                              | µg/L  | 2,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Bromochloromethane                        | µg/L  | 4,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | 72                     | 60                       | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 UJ               |
| Bromodichloromethane                      | µg/L  | 4.6             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Bromoform                                 | µg/L  | 36              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Bromomethane                              | µg/L  | 140             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 UJ               | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Carbon disulfide                          | µg/L  | 10,000          | < 1.0 UJ                  | < 1.0 UJ               | < 1.0 U                | < 1.0 U                | < 50 UJ                | < 50 UJ                  | < 1.0 U                | < 1.0 UJ               | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| Carbon tetrachloride                      | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | 6.0                    | < 0.5 U                | < 0.5 U                |
| Chlorobenzene                             | µg/L  | 100             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Chloroethane                              | µg/L  | 41,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 UJ               | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Chloroform                                | µg/L  | 1,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | 30 J                   | 31 J                     | 1.3                    | < 0.5 U                | 19                     | < 0.5 U                | 0.92 J                 |
| Chloromethane                             | µg/L  | 220             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 UJ               | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| cis-1,2-Dichloroethene                    | µg/L  | 70              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | 21,000                 | 20,000                   | 65                     | 10                     | 28                     | 15                     | 20                     |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Dibromochloromethane                      | µg/L  | 34              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Dibromomethane                            | µg/L  | 380             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Dichlorodifluoromethane                   | µg/L  | 20,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 UJ               | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 UJ               | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Ethylbenzene                              | µg/L  | 700             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Hexachlorobutadiene                       | µg/L  | 20              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 50 U                 | < 50 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Isopropylbenzene                          | µg/L  | 10,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| m,p-Xylene                                | µg/L  | 10,000**        | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 50 U                 | < 50 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| Methylene chloride                        | µg/L  | 5               | < 1.0 U                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | 42,000                 | 41,000                   | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                | < 1.0 U                |
| Naphthalene                               | µg/L  | 2,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| n-Butylbenzene                            | µg/L  | 4,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MSC/<br>PCL | 18WW24_121119<br>12/11/19 | CO3_121119<br>12/11/19 | CO8_121219<br>12/12/19 | CO9_121719<br>12/17/19 | MW2_121319<br>12/13/19 | MW2_121319-a<br>12/13/19 | MW3_121219<br>12/12/19 | MW5_121319<br>12/13/19 | MW7_120619<br>12/06/19 | MW8_120519<br>12/05/19 | MW9_120519<br>12/05/19 |
|--------------------------------|-------|-----------------|---------------------------|------------------------|------------------------|------------------------|------------------------|--------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| n-Propylbenzene                | µg/L  | 4,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| o-Xylene                       | µg/L  | 10,000**        | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| sec-Butylbenzene               | µg/L  | 4,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Styrene                        | µg/L  | 100             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| tert-Butylbenzene              | µg/L  | 4,100           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Tetrachloroethene              | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | 1.2                    | < 0.5 U                | 0.75 J                 | < 0.5 U                | < 0.5 U                |
| Toluene                        | µg/L  | 1,000           | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| trans-1,2-Dichloroethene       | µg/L  | 100             | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | 34 J                   | 30 J                     | 3.2                    | < 0.5 U                | 0.46 J                 | < 0.5 U                | < 0.5 U                |
| trans-1,3-Dichloropropene      | µg/L  | 29              | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Trichloroethene                | µg/L  | 5               | < 0.5 U                   | < 0.5 U                | 2.0                    | < 0.5 U                | 4,800                  | 4,400                    | 360                    | 40                     | 3,200                  | 180                    | 760                    |
| Trichlorofluoromethane         | µg/L  | 31,000          | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 0.5 U                |
| Vinyl chloride                 | µg/L  | 2               | < 0.5 U                   | < 0.5 U                | < 0.5 U                | < 0.5 U                | < 25 U                 | < 25 U                   | 25                     | 3.0 J                  | 1.8                    | < 0.5 U                | < 0.5 U                |
| <b>Metals (6020A)</b>          |       |                 |                           |                        |                        |                        |                        |                          |                        |                        |                        |                        |                        |
| Aluminum                       | mg/L  | 100             | 0.0872                    | NA                     | 0.0286                 | 0.149                  | 0.0283                 | 0.0314                   | 0.00215 UB             | 0.00447 UB             | NA                     | NA                     | 0.0208 UB              |
| Antimony                       | mg/L  | 0.006           | < 0.000500 U              | NA                     | < 0.000500 U           | < 0.000500 U           | 0.000434 J             | < 0.000500 U             | < 0.000500 U           | < 0.000500 U           | NA                     | NA                     | < 0.000500 U           |
| Arsenic                        | mg/L  | 0.01            | 0.00123 J                 | NA                     | < 0.000500 U           | < 0.000500 U           | 0.0440                 | 0.0431                   | < 0.000500 U           | < 0.000500 U           | NA                     | NA                     | < 0.000500 U           |
| Barium                         | mg/L  | 2               | 0.0733                    | NA                     | 4.53                   | 0.948                  | 2.62                   | 2.57                     | 0.614                  | 0.977                  | NA                     | NA                     | 0.0605                 |
| Beryllium                      | mg/L  | 0.004           | 0.000558 J                | NA                     | < 0.000500 U           | < 0.000500 U           | 0.000362 J             | 0.000394 J               | < 0.000500 U           | < 0.000500 U           | NA                     | NA                     | < 0.000500 U           |
| Cadmium                        | mg/L  | 0.005           | 0.000487 J                | NA                     | 0.000401 J             | 0.000207 J             | 0.000329 J             | 0.000495 J               | 0.000342 J             | 0.000789 J             | NA                     | NA                     | < 0.000500 U           |
| Calcium                        | mg/L  | NV              | 29.4                      | NA                     | 261                    | 236                    | 80.5                   | 77.1                     | 33.1                   | 23.1                   | NA                     | NA                     | 5.82                   |
| Chromium                       | mg/L  | 0.1             | 0.000461 J                | NA                     | < 0.000500 U           | 0.00256 J              | 0.0216                 | 0.0200                   | 0.000982 J             | 0.0330                 | NA                     | NA                     | 0.138                  |
| Cobalt                         | mg/L  | 6.1             | 0.00579                   | NA                     | 0.00355 J              | 0.00104 J              | 0.109                  | 0.107                    | 0.00483 J              | 0.00353 J              | NA                     | NA                     | 0.00128 J              |
| Copper                         | mg/L  | 1.3             | 0.00152 J                 | NA                     | < 0.00250 U            | < 0.00250 U            | 0.00306 J              | 0.00301 J                | < 0.00250 U            | < 0.00250 U            | NA                     | NA                     | < 0.00250 U            |
| Iron                           | mg/L  | NV              | 0.0979 UB                 | NA                     | 0.558 UB               | 0.159 J                | 36.4                   | 35.6                     | 0.343 UB               | 0.127 UB               | NA                     | NA                     | 0.864                  |
| Lead                           | mg/L  | 0.015           | < 0.00100 U               | NA                     | < 0.00100 U            | < 0.00100 U            | < 0.00100 U            | < 0.00100 U              | < 0.00100 U            | < 0.00100 U            | NA                     | NA                     | < 0.00100 U            |
| Magnesium                      | mg/L  | NV              | 24.0                      | NA                     | 168                    | 79.1                   | 59.0                   | 58.2                     | 20.6                   | 24.8                   | NA                     | NA                     | 1.95                   |
| Manganese                      | mg/L  | 1.1*            | 2.09                      | NA                     | 0.452                  | 0.169                  | 6.09                   | 6.27                     | 2.47                   | 0.0984                 | NA                     | NA                     | 0.0324                 |
| Nickel                         | mg/L  | 0.49*           | 0.108                     | NA                     | 0.00153 J              | 0.0250                 | 0.0628                 | 0.0612                   | 0.00606                | 0.0630                 | NA                     | NA                     | 0.00604                |
| Potassium                      | mg/L  | NV              | 0.604                     | NA                     | 1.96                   | 0.977                  | 2.96                   | 2.98                     | 1.76                   | 2.30                   | NA                     | NA                     | 0.396                  |
| Selenium                       | mg/L  | 0.05            | < 0.00250 U               | NA                     | < 0.00250 U            | < 0.00250 U            | < 0.00250 U            | < 0.00250 U              | < 0.00250 U            | < 0.00250 U            | NA                     | NA                     | < 0.00250 U            |
| Silver                         | mg/L  | 0.51            | < 0.000500 U              | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             | < 0.000500 U           | < 0.000500 U           | NA                     | NA                     | < 0.000500 U           |
| Sodium                         | mg/L  | NV              | 567                       | NA                     | 717                    | 256                    | 220                    | 217                      | 292                    | 129                    | NA                     | NA                     | 13.2                   |
| Thallium                       | mg/L  | 0.002           | 0.000536 J                | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             | < 0.000500 U           | < 0.000500 U           | NA                     | NA                     | < 0.000500 U           |
| Vanadium                       | mg/L  | 0.72            | 0.00129 J                 | NA                     | 0.000998 J             | < 0.00100 U            | 0.00191 J              | 0.00150 J                | 0.000932 J             | 0.00147 J              | NA                     | NA                     | 0.000987 J             |
| Zinc                           | mg/L  | 31              | 0.0483                    | NA                     | 0.00604                | 0.00734 UB             | 0.148                  | 0.142                    | 0.00550                | 0.0222                 | NA                     | NA                     | 0.00680                |
| Mercury                        | mg/L  | 0.002           | < 0.000100 U              | NA                     | < 0.000100 U           | < 0.000100 U           | < 0.000100 U           | < 0.000100 U             | < 0.000100 U           | < 0.000100 U           | NA                     | NA                     | < 0.000100 U           |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                 |                           |                        |                        |                        |                        |                          |                        |                        |                        |                        |                        |
| 1,4-Dioxane                    | µg/L  | 9.1*            | NA                        | 0.054                  | 1.2                    | NA                     | 5.7                    | 7.1                      | NA                     | 1.6                    | 42                     | 2.9                    | 0.71                   |

## Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MSC/<br>PCL | MW10_120519<br>12/05/19 | MW14_121719<br>12/17/19 | MW16_120919<br>12/09/19 | MW17_120519<br>12/05/19 | MW18_121719<br>12/17/19 | MW19_120919<br>12/09/19 | MW20_120519<br>12/05/19 | MW20_120519-a<br>12/05/19 | MW21_121119<br>12/11/19 | MW21_121119-a<br>12/11/19 | MW22_121119<br>12/11/19 |
|---|-------|-----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|-------------------------|---------------------------|-------------------------|
| Lab Package                               |       |                 | HS19120354              | HS19121036              | HS19120544              | HS19120354              | HS19121036              | HS19120544              | HS19120354              | HS19120354                | HS19120702              | HS19120702                | HS19120702              |
| Well ID                                   |       |                 | MW-10                   | MW-14                   | MW-16                   | MW-17                   | MW-18                   | MW-19                   | MW-20                   | MW-20                     | MW-21                   | MW-21                     | MW-22                   |
| Aquifer Zone:                             |       |                 | Shallow                 | Wilcox                  | Shallow                 | Shallow                 | Shallow                 | Shallow                 | Shallow                 | Shallow                   | Shallow                 | Shallow                   | Shallow                 |
| <b>Perchlorate (6850)</b>                 |       |                 |                         |                         |                         |                         |                         |                         |                         |                           |                         |                           |                         |
| Perchlorate                               | µg/L  | 17*             | < 2.0 U                 | 130,000                 | 1.8 J                   | < 2.0 U                 | < 2.0 U                 | < 2.0 U                 | < 2.0 U                 | < 2.0 U                   | 13,000                  | 13,000                    | 210                     |
| <b>Volatile Organic Compounds (8260C)</b> |       |                 |                         |                         |                         |                         |                         |                         |                         |                           |                         |                           |                         |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,1,1-Trichloroethane                     | µg/L  | 200             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,1,2,2-Tetrachloroethane                 | µg/L  | 14              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,1,2-Trichloroethane                     | µg/L  | 5               | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | 6.6 J                   | 6.1 J                     | < 0.5 U                 |
| 1,1-Dichloroethane                        | µg/L  | 10,000          | < 0.5 U                 | 26                      | 1.4                     | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,1-Dichloroethene                        | µg/L  | 7               | < 0.5 U                 | 87                      | 6.1                     | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,1-Dichloropropene                       | µg/L  | 2.9             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2,3-Trichlorobenzene                    | µg/L  | 310             | < 0.5 U                 | < 12 UJ                 | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2,3-Trichloropropane                    | µg/L  | 0.041           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2-Dibromo-3-chloropropane               | µg/L  | 0.2             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2-Dibromoethane                         | µg/L  | 0.05            | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2-Dichlorobenzene                       | µg/L  | 600             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,2-Dichloroethane                        | µg/L  | 5               | < 0.5 U                 | 73                      | 43                      | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | 19                      | 19                        | 4.3                     |
| 1,2-Dichloropropane                       | µg/L  | 5               | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,3-Dichlorobenzene                       | µg/L  | 3,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,3-Dichloropropane                       | µg/L  | 29              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 1,4-Dichlorobenzene                       | µg/L  | 75              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 2,2-Dichloropropane                       | µg/L  | 42              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 2-Butanone                                | µg/L  | 61,000          | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| 2-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 2-Hexanone                                | µg/L  | 6,100           | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| 4-Chlorotoluene                           | µg/L  | 2,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 4-Isopropyltoluene                        | µg/L  | 10,000          | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| 4-Methyl-2-pentanone                      | µg/L  | 8,200           | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| Acetone                                   | µg/L  | 92,000          | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| Benzene                                   | µg/L  | 5               | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | 0.89 J                  |
| Bromobenzene                              | µg/L  | 2,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Bromochloromethane                        | µg/L  | 4,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Bromodichloromethane                      | µg/L  | 4.6             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Bromoform                                 | µg/L  | 36              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Bromomethane                              | µg/L  | 140             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Carbon disulfide                          | µg/L  | 10,000          | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 UJ                 | < 10 UJ                   | < 1.0 UJ                |
| Carbon tetrachloride                      | µg/L  | 5               | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Chlorobenzene                             | µg/L  | 100             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Chloroethane                              | µg/L  | 41,000          | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Chloroform                                | µg/L  | 1,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | 6.0 J                   | 6.4 J                     | 2.2                     |
| Chloromethane                             | µg/L  | 220             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| cis-1,2-Dichloroethene                    | µg/L  | 70              | < 0.5 U                 | 2,100                   | 24                      | NA                      | 0.81 J                  | 2.7                     | < 0.5 U                 | < 0.5 U                   | 400                     | 400                       | 3.2                     |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Dibromochloromethane                      | µg/L  | 34              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Dibromomethane                            | µg/L  | 380             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Dichlorodifluoromethane                   | µg/L  | 20,000          | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Ethylbenzene                              | µg/L  | 700             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Hexachlorobutadiene                       | µg/L  | 20              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 10 U                  | < 10 U                    | < 0.5 U                 |
| Isopropylbenzene                          | µg/L  | 10,000          | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| m,p-Xylene                                | µg/L  | 10,000**        | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| Methylene chloride                        | µg/L  | 5               | < 1.0 U                 | < 25 U                  | < 1.0 U                 | NA                      | < 1.0 U                 | < 1.0 U                 | < 1.0 U                 | < 1.0 U                   | < 10 U                  | < 10 U                    | < 1.0 U                 |
| Naphthalene                               | µg/L  | 2,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| n-Butylbenzene                            | µg/L  | 4,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MSC/<br>PCL | MW10_120519<br>12/05/19 | MW14_121719<br>12/17/19 | MW16_120919<br>12/09/19 | MW17_120519<br>12/05/19 | MW18_121719<br>12/17/19 | MW19_120919<br>12/09/19 | MW20_120519<br>12/05/19 | MW20_120519-a<br>12/05/19 | MW21_121119<br>12/11/19 | MW21_121119-a<br>12/11/19 | MW22_121119<br>12/11/19 |
|--------------------------------|-------|-----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|-------------------------|---------------------------|-------------------------|
| n-Propylbenzene                | µg/L  | 4,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| o-Xylene                       | µg/L  | 10,000**        | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| sec-Butylbenzene               | µg/L  | 4,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Styrene                        | µg/L  | 100             | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| tert-Butylbenzene              | µg/L  | 4,100           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Tetrachloroethene              | µg/L  | 5               | < 0.5 U                 | < 12 U                  | < 5.0 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Toluene                        | µg/L  | 1,000           | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| trans-1,2-Dichloroethene       | µg/L  | 100             | < 0.5 U                 | 19 J                    | 0.53 J                  | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| trans-1,3-Dichloropropene      | µg/L  | 29              | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 U                 | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Trichloroethene                | µg/L  | 5               | 1.3                     | 9,200                   | 550                     | NA                      | 13                      | 1.2                     | < 0.5 U                 | < 0.5 U                   | 3,200                   | 3,200                     | 240                     |
| Trichlorofluoromethane         | µg/L  | 31,000          | < 0.5 U                 | < 12 U                  | < 0.5 U                 | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | < 5.0 U                 | < 5.0 U                   | < 0.5 U                 |
| Vinyl chloride                 | µg/L  | 2               | < 0.5 U                 | < 12 U                  | 1.7                     | NA                      | < 0.5 UJ                | < 0.5 U                 | < 0.5 U                 | < 0.5 U                   | 9.2 J                   | 8.6 J                     | < 0.5 U                 |
| <b>Metals (6020A)</b>          |       |                 |                         |                         |                         |                         |                         |                         |                         |                           |                         |                           |                         |
| Aluminum                       | mg/L  | 100             | NA                      | 0.0444                  | NA                      | NA                      | NA                      | 0.461                   | NA                      | NA                        | 0.00790 UB              | 0.00780 UB                | 0.0245                  |
| Antimony                       | mg/L  | 0.006           | NA                      | < 0.000500 U            | NA                      | NA                      | NA                      | < 0.000500 U            | NA                      | NA                        | < 0.000500 U            | < 0.000500 U              | 0.000693 J              |
| Arsenic                        | mg/L  | 0.01            | NA                      | 0.00751                 | NA                      | NA                      | NA                      | 0.00705                 | NA                      | NA                        | 0.000444 J              | < 0.000500 U              | 0.00130 J               |
| Barium                         | mg/L  | 2               | NA                      | 0.202                   | NA                      | NA                      | NA                      | 0.547                   | NA                      | NA                        | 4.46                    | 4.45                      | 0.897                   |
| Beryllium                      | mg/L  | 0.004           | NA                      | 0.000360 J              | NA                      | NA                      | NA                      | < 0.000500 U            | NA                      | NA                        | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            |
| Cadmium                        | mg/L  | 0.005           | NA                      | 0.000887 J              | NA                      | NA                      | NA                      | 0.000382 J              | NA                      | NA                        | 0.000516 J              | 0.000542 J                | 0.000500 J              |
| Calcium                        | mg/L  | NV              | NA                      | 87.4                    | NA                      | NA                      | NA                      | 110                     | NA                      | NA                        | 170                     | 168                       | 74.0                    |
| Chromium                       | mg/L  | 0.1             | NA                      | 0.0844                  | NA                      | NA                      | NA                      | 0.0839                  | NA                      | NA                        | 0.201                   | 0.223                     | 0.520                   |
| Cobalt                         | mg/L  | 6.1             | NA                      | 0.0415                  | NA                      | NA                      | NA                      | 0.0106                  | NA                      | NA                        | 0.0495                  | 0.0497                    | 0.0101                  |
| Copper                         | mg/L  | 1.3             | NA                      | 0.00180 J               | NA                      | NA                      | NA                      | 0.00372 J               | NA                      | NA                        | 0.0360                  | 0.0361                    | 0.0109                  |
| Iron                           | mg/L  | NV              | NA                      | 101                     | NA                      | NA                      | NA                      | 88.9                    | NA                      | NA                        | 2.92                    | 2.86                      | 6.06                    |
| Lead                           | mg/L  | 0.015           | NA                      | < 0.00100 U             | NA                      | NA                      | NA                      | < 0.00100 U             | NA                      | NA                        | < 0.00100 U             | < 0.00100 U               | < 0.00100 U             |
| Magnesium                      | mg/L  | NV              | NA                      | 51.6                    | NA                      | NA                      | NA                      | 60.4                    | NA                      | NA                        | 130                     | 128                       | 33.7                    |
| Manganese                      | mg/L  | 1.1*            | NA                      | 3.76                    | NA                      | NA                      | NA                      | 2.23                    | NA                      | NA                        | 1.60                    | 1.60                      | 0.257                   |
| Nickel                         | mg/L  | 0.49*           | NA                      | 0.112                   | NA                      | NA                      | NA                      | 0.0736                  | NA                      | NA                        | 0.549                   | 0.541                     | 0.283                   |
| Potassium                      | mg/L  | NV              | NA                      | 10.1                    | NA                      | NA                      | NA                      | 4.48                    | NA                      | NA                        | 2.09                    | 2.05                      | 2.07                    |
| Selenium                       | mg/L  | 0.05            | NA                      | < 0.00250 U             | NA                      | NA                      | NA                      | < 0.0250 U              | NA                      | NA                        | < 0.00250 U             | < 0.00250 U               | < 0.00250 U             |
| Silver                         | mg/L  | 0.51            | NA                      | < 0.000500 U            | NA                      | NA                      | NA                      | < 0.000500 U            | NA                      | NA                        | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            |
| Sodium                         | mg/L  | NV              | NA                      | 363                     | NA                      | NA                      | NA                      | 852                     | NA                      | NA                        | 465                     | 455                       | 375                     |
| Thallium                       | mg/L  | 0.002           | NA                      | < 0.000500 U            | NA                      | NA                      | NA                      | < 0.000500 U            | NA                      | NA                        | < 0.000500 U            | < 0.000500 U              | < 0.000500 U            |
| Vanadium                       | mg/L  | 0.72            | NA                      | < 0.00100 U             | NA                      | NA                      | NA                      | 0.00207 J               | NA                      | NA                        | 0.00186 J               | 0.00182 J                 | 0.00337 J               |
| Zinc                           | mg/L  | 31              | NA                      | 0.761                   | NA                      | NA                      | NA                      | 0.0123                  | NA                      | NA                        | 0.0199                  | 0.0181                    | 0.00329 J               |
| Mercury                        | mg/L  | 0.002           | NA                      | < 0.000100 U            | NA                      | NA                      | NA                      | < 0.000100 U            | NA                      | NA                        | < 0.000100 U            | < 0.000100 U              | < 0.000100 U            |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                 |                         |                         |                         |                         |                         |                         |                         |                           |                         |                           |                         |
| 1,4-Dioxane                    | µg/L  | 9.1*            | 0.13                    | 390                     | 23                      | 0.37                    | NA                      | NA                      | NA                      | NA                        | 4.9                     | 4.4                       | NA                      |

## Notes:

Blue highlighting indicates concentrations above the MCL/MSC/PCL

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:              | Units | MCL/MSCL<br>PCL | MW23_121219<br>12/12/19 | MW23_121219-a<br>12/12/19 | 109_121219<br>12/12/19 | 120_121719<br>12/17/19 | 125_121219<br>12/12/19 | 126_121719<br>12/17/19 | 126_121719-a<br>12/17/19 |
|---|-------|-----------------|-------------------------|---------------------------|------------------------|------------------------|------------------------|------------------------|--------------------------|
| Lab Package                               |       |                 | HS19120765              | HS19120765                | HS19120765             | HS19121036             | HS19120765             | HS19121036             | HS19121036               |
| Well ID                                   |       |                 | MW-23                   | MW-23                     | 109                    | 120                    | 125                    | 126                    | 126                      |
| Aquifer Zone:                             |       |                 | Shallow                 | Shallow                   | Shallow                | Shallow                | Shallow                | Shallow                | Shallow                  |
| <b>Perchlorate (6850)</b>                 |       |                 |                         |                           |                        |                        |                        |                        |                          |
| Perchlorate                               | µg/L  | 17*             | 73,000                  | 80,000                    | 1,000                  | 23,000                 | 1,800                  | < 2.0 U                | < 2.0 U                  |
| <b>Volatile Organic Compounds (8260C)</b> |       |                 |                         |                           |                        |                        |                        |                        |                          |
| 1,1,1,2-Tetrachloroethane                 | µg/L  | 110             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1,1-Trichloroethane                     | µg/L  | 200             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1,2,2-Tetrachloroethane                 | µg/L  | 14              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1,2-Trichloroethane                     | µg/L  | 5               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1-Dichloroethane                        | µg/L  | 10,000          | < 5.0 U                 | < 5.0 U                   | 0.89 J                 | 16 J                   | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1-Dichloroethene                        | µg/L  | 7               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | 79                     | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,1-Dichloropropene                       | µg/L  | 2.9             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2,3-Trichlorobenzene                    | µg/L  | 310             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2,3-Trichloropropane                    | µg/L  | 0.041           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2,4-Trichlorobenzene                    | µg/L  | 70              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2,4-Trimethylbenzene                    | µg/L  | 5,100           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2-Dibromo-3-chloropropane               | µg/L  | 0.2             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2-Dibromoethane                         | µg/L  | 0.05            | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2-Dichlorobenzene                       | µg/L  | 600             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2-Dichloroethane                        | µg/L  | 5               | 69                      | 68                        | < 0.5 U                | 25                     | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,2-Dichloropropane                       | µg/L  | 5               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,3,5-Trimethylbenzene                    | µg/L  | 5,100           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,3-Dichlorobenzene                       | µg/L  | 3,100           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,3-Dichloropropane                       | µg/L  | 29              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 1,4-Dichlorobenzene                       | µg/L  | 75              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 2,2-Dichloropropane                       | µg/L  | 42              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 2-Butanone                                | µg/L  | 61,000          | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| 2-Chlorotoluene                           | µg/L  | 2,000           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 2-Hexanone                                | µg/L  | 6,100           | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| 4-Chlorotoluene                           | µg/L  | 2,000           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 4-Isopropyltoluene                        | µg/L  | 10,000          | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| 4-Methyl-2-pentanone                      | µg/L  | 8,200           | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| Acetone                                   | µg/L  | 92,000          | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| Benzene                                   | µg/L  | 5               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Bromobenzene                              | µg/L  | 2,000           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Bromochloromethane                        | µg/L  | 4,100           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Bromodichloromethane                      | µg/L  | 4.6             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Bromoform                                 | µg/L  | 36              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Bromomethane                              | µg/L  | 140             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Carbon disulfide                          | µg/L  | 10,000          | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| Carbon tetrachloride                      | µg/L  | 5               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Chlorobenzene                             | µg/L  | 100             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Chloroethane                              | µg/L  | 41,000          | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Chloroform                                | µg/L  | 1,000           | 9.1 J                   | 8.7 J                     | 1.3                    | 20 J                   | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Chloromethane                             | µg/L  | 220             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| cis-1,2-Dichloroethene                    | µg/L  | 70              | 19                      | 18                        | 120                    | 1,100                  | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| cis-1,3-Dichloropropene                   | µg/L  | 5.3             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Dibromochloromethane                      | µg/L  | 34              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Dibromomethane                            | µg/L  | 380             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Dichlorodifluoromethane                   | µg/L  | 20,000          | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Ethylbenzene                              | µg/L  | 700             | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Hexachlorobutadiene                       | µg/L  | 20              | < 10 U                  | < 10 U                    | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Isopropylbenzene                          | µg/L  | 10,000          | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| m,p-Xylene                                | µg/L  | 10,000**        | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| Methylene chloride                        | µg/L  | 5               | < 10 U                  | < 10 U                    | < 1.0 U                | < 25 U                 | < 1.0 U                | < 1.0 U                | < 1.0 U                  |
| Naphthalene                               | µg/L  | 2,000           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| n-Butylbenzene                            | µg/L  | 4,100           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |

## LHAAP-18/24 Analytical Results - December 2019

| Location ID:<br>Sample Date:   | Units | MCL/MS/CL<br>PCL | MW23_121219<br>12/12/19 | MW23_121219-a<br>12/12/19 | 109_121219<br>12/12/19 | 120_121719<br>12/17/19 | 125_121219<br>12/12/19 | 126_121719<br>12/17/19 | 126_121719-a<br>12/17/19 |
|--------------------------------|-------|------------------|-------------------------|---------------------------|------------------------|------------------------|------------------------|------------------------|--------------------------|
| n-Propylbenzene                | µg/L  | 4,100            | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| o-Xylene                       | µg/L  | 10,000**         | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| sec-Butylbenzene               | µg/L  | 4,100            | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Styrene                        | µg/L  | 100              | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| tert-Butylbenzene              | µg/L  | 4,100            | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Tetrachloroethene              | µg/L  | 5                | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Toluene                        | µg/L  | 1,000            | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| trans-1,2-Dichloroethene       | µg/L  | 100              | < 5.0 U                 | < 5.0 U                   | 1.4                    | 10 J                   | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| trans-1,3-Dichloropropene      | µg/L  | 29               | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Trichloroethene                | µg/L  | 5                | 3000                    | 3000                      | 400                    | 9,200                  | 0.89 J                 | < 0.5 U                | < 0.5 U                  |
| Trichlorofluoromethane         | µg/L  | 31,000           | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | < 12 U                 | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| Vinyl chloride                 | µg/L  | 2                | < 5.0 U                 | < 5.0 U                   | < 0.5 U                | 21 J                   | < 0.5 U                | < 0.5 U                | < 0.5 U                  |
| <b>Metals (6020A)</b>          |       |                  |                         |                           |                        |                        |                        |                        |                          |
| Aluminum                       | mg/L  | 100              | NA                      | NA                        | NA                     | NA                     | 0.430                  | 0.0570                 | 0.0507                   |
| Antimony                       | mg/L  | 0.006            | NA                      | NA                        | NA                     | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             |
| Arsenic                        | mg/L  | 0.01             | NA                      | NA                        | NA                     | NA                     | 0.000643 J             | 0.00342 J              | 0.00323 J                |
| Barium                         | mg/L  | 2                | NA                      | NA                        | NA                     | NA                     | 0.107                  | 8.65                   | 8.50                     |
| Beryllium                      | mg/L  | 0.004            | NA                      | NA                        | NA                     | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             |
| Cadmium                        | mg/L  | 0.005            | NA                      | NA                        | NA                     | NA                     | < 0.000500 U           | 0.000301 J             | 0.000264 J               |
| Calcium                        | mg/L  | NV               | NA                      | NA                        | NA                     | NA                     | 2.06                   | 313                    | 316                      |
| Chromium                       | mg/L  | 0.1              | NA                      | NA                        | NA                     | NA                     | 0.00167 J              | < 0.00500 U            | < 0.00500 U              |
| Cobalt                         | mg/L  | 6.1              | NA                      | NA                        | NA                     | NA                     | 0.000632 J             | 0.0103                 | 0.00992                  |
| Copper                         | mg/L  | 1.3              | NA                      | NA                        | NA                     | NA                     | < 0.00250 U            | < 0.00250 U            | < 0.00250 U              |
| Iron                           | mg/L  | NV               | NA                      | NA                        | NA                     | NA                     | 0.617 UB               | 2.77                   | 2.80                     |
| Lead                           | mg/L  | 0.015            | NA                      | NA                        | NA                     | NA                     | < 0.00100 U            | < 0.00100 U            | < 0.00100 U              |
| Magnesium                      | mg/L  | NV               | NA                      | NA                        | NA                     | NA                     | 1.56                   | 235                    | 243                      |
| Manganese                      | mg/L  | 1.1*             | NA                      | NA                        | NA                     | NA                     | 0.0135                 | 0.165                  | 0.160                    |
| Nickel                         | mg/L  | 0.49*            | NA                      | NA                        | NA                     | NA                     | 0.00252 J              | 0.0121                 | 0.0119                   |
| Potassium                      | mg/L  | NV               | NA                      | NA                        | NA                     | NA                     | 0.676                  | 3.28                   | 3.23                     |
| Selenium                       | mg/L  | 0.05             | NA                      | NA                        | NA                     | NA                     | < 0.00250 U            | < 0.00250 U            | < 0.00250 U              |
| Silver                         | mg/L  | 0.51             | NA                      | NA                        | NA                     | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             |
| Sodium                         | mg/L  | NV               | NA                      | NA                        | NA                     | NA                     | 43.8                   | 838                    | 850                      |
| Thallium                       | mg/L  | 0.002            | NA                      | NA                        | NA                     | NA                     | < 0.000500 U           | < 0.000500 U           | < 0.000500 U             |
| Vanadium                       | mg/L  | 0.72             | NA                      | NA                        | NA                     | NA                     | 0.00209 J              | 0.00153 J              | 0.00164 J                |
| Zinc                           | mg/L  | 31               | NA                      | NA                        | NA                     | NA                     | 0.00554                | 0.0229                 | 0.0228                   |
| Mercury                        | mg/L  | 0.002            | NA                      | NA                        | NA                     | NA                     | < 0.000100 U           | 0.0000340 J            | 0.0000310 J              |
| <b>1,4-Dioxane (8270D SIM)</b> |       |                  |                         |                           |                        |                        |                        |                        |                          |
| 1,4-Dioxane                    | µg/L  | 9.1*             | NA                      | NA                        | 0.7                    | 48                     | NA                     | 1.8                    | 0.71                     |

## Notes:

Blue highlighting indicates concentrations above the MCL/MS/CL

MCL/MS/CL - Maximum Contaminant Limit/Medium-Specific Concentrations/Protective Concentration Level

NA - Not Analyzed

µg/L - micrograms per liter

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.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

UB - considered a non-detect due to blank contamination

NV - No Value

\*Perchlorate, manganese, 1,4-dioxane and nickel compared to the PCL

\*\* Value is for total xylenes

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential

a - duplicate sample



LHAAP-58 Remedial Action Operation Validated Data - December 2019

| Location ID:<br>Sample Date:  | Units                              | MCL/MSC       | 03WW01_12181<br>9<br>12/18/19      | 35ASW03                            | 35AWW01_122019<br>12/20/19         | 35AWW06_121919<br>12/19/19           | 35AWW08_121819<br>12/18/19         | 35AWW09_121819<br>12/18/19         | 35AWW10_121919<br>12/19/19           | 35AWW10_121919-a<br>12/19/19                   | 35AWW11_121819<br>12/18/19          | 35AWW12_121819<br>12/18/19          | 35AWW13_121819<br>12/18/19           | 35AWW14_121919<br>12/19/19           | 35AWW15_12201<br>9<br>12/20/19     | 35AWW16_121919<br>12/19/19                                | 35AWW17_121819<br>12/18/19           | 35AWW18_121819<br>12/18/19            | 35AWW19_121819<br>12/18/19          | 35AWW20_121919<br>12/19/19          |
|-------------------------------|------------------------------------|---------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|--|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|---|--------------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|
| Location Description          | Site 58 - E, inside site boundary. |               | Site 58 - E, inside site boundary. | Site 58 - E, inside site boundary. | Site 58 - E, inside site boundary. | Site 58 - SW, outside site boundary. | Site 58 - E, inside site boundary. | Site 58 - E, inside site boundary. | Site 58 - ESE, inside site boundary. | Site 58 - ESE, inside site boundary. Duplicate | Site 58 - SE, inside site boundary. | Site 58 - E, outside site boundary. | Site 58 - SE, outside site boundary. | Site 58 - SE, outside site boundary. | Site 58 - W, inside site boundary. | Site 58 - SW, outside site boundary, near Building 744-A. | Site 58 - SW, outside site boundary. | Site 58 - SSW, outside site boundary. | Site 58 - S, outside site boundary. | Site 58 - SW, inside site boundary. |
| Location Depth                | Shallow                            | Surface Water | Intermediate                       | Shallow                            | Shallow                            | Shallow                              | Shallow                            | Shallow                            | Shallow                              | Shallow  | Shallow                             | Shallow                             | Shallow                              | Shallow                              | Shallow                            | Shallow   | Shallow                              | Shallow                               | Shallow                             | Shallow                             |
| BAV1 Vinyl Chloride Reductase | cells/mL                           | NV            | 0.7                                |                                    | NA                                 | 29.6                                 | < 3.1 U                            | < 2.6 U                            | NA                                   | NA   | < 0.60 U                            | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | < 0.50 U                            | 49100                               |
| Dehalobacter spp.             | cells/mL                           | NV            | 2480                               |                                    | NA                                 | < 10.2 U                             | 173000                             | 42500                              | NA                                   | NA   | 213000                              | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | 12200                               | 6070                                |
| Dehalococcoides               | cells/mL                           | NV            | 22,200                             |                                    | NA                                 | 80.3                                 | 1200000                            | 2,400,000                          | NA                                   | NA   | 900                                 | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | 14.8                                | 27800                               |
| tceA Reductase                | cells/mL                           | NV            | 595                                |                                    | NA                                 | < 1.0 U                              | 313000                             | 377000                             | NA                                   | NA   | 6.70                                | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | 0.3 J                               | < 0.5 U                             |
| Vinyl Chloride Reductase      | cells/mL                           | NV            | 6080                               |                                    | NA                                 | < 1.0 U                              | 366000                             | 330000                             | NA                                   | NA   | 99.7                                | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | 0.60                                | 4.60                                |
| Metals (SW6020)               |                                    |               |                                    |                                    |                                    |                                      |                                    |                                    |                                      |  |                                     |                                     |                                      |                                      |                                    |   |                                      |                                       |                                     |                                     |
| Arsenic                       | mg/L                               | 0.01          | 0.0158                             |                                    | NA                                 | NA                                   | 0.0253                             | 0.000606 J                         | NA                                   | NA   | NA                                  | NA                                  | NA                                   | NA                                   | NA                                 | NA  | NA                                   | NA                                    | NA                                  | NA                                  |

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

U - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

NV - No Value



| Location ID:<br>Sample Date:         | Units | MCL/MSC | 34AWW21_122019<br>12/20/19  | 34AWW21_122019-a<br>12/20/19   | 35AWW22_121819<br>12/18/19                  | 35AWW23_121819<br>12/18/19                 | 35AWW24_121919<br>12/19/19            | LHSMW04 | LHSMW06_122019<br>12/20/19  | LHSMW06_122019-a<br>12/20/19   | LHSMW07_121919<br>12/19/19                 |
|--------------------------------------|-------|---------|---|--|---|--|---------------------------------------|---------|---|--|--|
| Location Description                 |       |         | Site 58 - ESE,<br>outside site<br>boundary, beside<br>Building 725. | Site 58 - ESE,<br>outside site<br>boundary, beside<br>Building 725.<br>Duplicate | Site 58 - ENE,<br>outside site<br>boundary. | Site 58 - SW,<br>outside site<br>boundary. | Downgradient<br>Western Plume<br>well |         | Site 58 - SW,<br>inside site<br>boundary, beside<br>Building 715. | Site 58 - SW,<br>inside site<br>boundary, beside<br>Building 715.<br>Duplicate | Site 58 - SW,<br>outside site<br>boundary. |
| Location Depth                       |       |         | Shallow   | Shallow  | Shallow                                     | Shallow                                    | Shallow                               |         | Shallow   | Shallow  | Shallow                                    |
| Frequency                            |       |         |   |  |   |  | Quarterly                             |         |   |  | Quarterly                                  |
| Lab Package                          |       |         | HS19121257  | HS19121257   | HS19121092                                  | HS19121092                                 | HS19121155                            |         | HS19121257  | HS19121257   | HS19121155                                 |
| Total Organic Carbon (415.1/SM5310C) |       |         |   |  |   |  |                                       |         |   |  |  |
| Total Organic Carbon                 | mg/L  | NV      | NA  | NA   | NA  | 127  | NA                                    |         | NA  | NA   | 3.48 J                                     |
| Volatile Organic Compounds (8260C)   |       |         |   |  |   |  |                                       |         |   |  |  |
| 1,1,1,2-Tetrachloroethane            | µg/L  | 110     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                | Dry     | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 1,1,1-Trichloroethane                | µg/L  | 200     | <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            | µg/L  | 14      | <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-Trichloroethane                | µg/L  | 5       | <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-Dichloroethane                   | µg/L  | 10000   | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | 13   |
| 1,1-Dichloroethane                   | µg/L  | 7       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | 8.4   | 8.4  | 13   |
| 1,1-Dichloropropene                  | µg/L  | 2.9     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | 19 J  | 20 J   | 46 J                                       |
| 1,2,3-Trichlorobenzene               | µg/L  | 310     | <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-Trichloropropane               | µg/L  | 0.041   | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 1,2,4-Trichlorobenzene               | µg/L  | 70      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 1,2,4-Trimethylbenzene               | µg/L  | 5100    | <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          | µg/L  | 0.2     | <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-Dibromoethane                    | µg/L  | 0.05    | <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                  | µg/L  | 600     | <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-Dichloroethane                   | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | 0.64 J                                     |
| 1,2-Dichloropropane                  | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 1,3,5-Trimethylbenzene               | µg/L  | 5100    | <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                  | µg/L  | 3100    | <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                  | µg/L  | 29      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 1,4-Dichlorobenzene                  | µg/L  | 75      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| 2,2-Dichloropropane                  | µg/L  | 42      | <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                           | µg/L  | 61000   | <1.0 U  | <1.0 U   | <1.0 U                                      | 390  | <1.0 U                                |         | <1.0 U  | <1.0 U   | <1.0 U                                     |
| 2-Chlorotoluene                      | µg/L  | 2000    | <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-Hexanone                           | µg/L  | 6100    | <1.0 U  | <1.0 U   | <1.0 U                                      | <0.5 U                                     | <1.0 U                                |         | <1.0 U  | <1.0 U   | <1.0 U                                     |
| 4-Chlorotoluene                      | µg/L  | 2000    | <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-Isopropyltoluene                   | µg/L  | 10000   | <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                 | µg/L  | 8200    | <1.0 U  | <1.0 U   | <1.0 U                                      | <1.0 U                                     | <1.0 U                                |         | <1.0 U  | <1.0 U   | <1.0 U                                     |
| Acetone                              | µg/L  | 92000   | <1.0 U  | <1.0 U   | <2.0 U                                      | 480 J                                      | <1.0 U                                |         | <2.0 U  | <2.0 U   | <1.0 U                                     |
| Benzene                              | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Bromobenzene                         | µg/L  | 2000    | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Bromochloromethane                   | µg/L  | 4100    | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Bromodichloromethane                 | µg/L  | 4.6     | <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                            | µg/L  | 36      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Bromomethane                         | µg/L  | 140     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Carbon disulfide                     | µg/L  | 10000   | <1.0 U  | <1.0 U   | <1.0 U                                      | <1.0 U                                     | <1.0 U                                |         | <1.0 U  | <1.0 U   | <1.0 U                                     |
| Carbon tetrachloride                 | µg/L  | 5       | <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                        | µg/L  | 100     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Chloroethane                         | µg/L  | 41000   | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Chloroform                           | µg/L  | 1000    | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Chloromethane                        | µg/L  | 220     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| cis-1,2-Dichloroethene               | µg/L  | 70      | <0.5 U  | <0.5 U   | <0.5 U                                      | 7.6  | <0.5 U                                |         | 68 J  | 68 J   | 1.2 J                                      |
| cis-1,3-Dichloropropene              | µg/L  | 5.3     | <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                 | µg/L  | 34      | <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                       | µg/L  | 380     | <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              | µg/L  | 20000   | <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                         | µg/L  | 700     | <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                  | µg/L  | 20      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <1.0 U                                |         | <0.5 U  | <0.5 U   | <1.0 U                                     |
| Isopropylbenzene                     | µg/L  | 10000   | <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                           | µg/L  | 10000   | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <1.0 U                                |         | <0.5 U  | <0.5 U   | <1.0 U                                     |
| Methylene chloride                   | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <1.0 U                                |         | <0.5 U  | <0.5 U   | <1.0 U                                     |
| n-Butylbenzene                       | µg/L  | 4100    | <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                      | µg/L  | 4100    | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Naphthalene                          | µg/L  | 2000    | <0.5 U  | <0.5 U   | <0.5 U                                      | 1.6  | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| o-Xylene                             | µg/L  | 10000   | <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                     | µg/L  | 4100    | <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                              | µg/L  | 100     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| tert-Butylbenzene                    | µg/L  | 4100    | <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                    | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | 1.9 J   | 1.9 J  | <0.5 U                                     |
| Toluene                              | µg/L  | 1000    | <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             | µg/L  | 100     | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | 1.4 J   | 1.5 J  | <0.5 U                                     |
| trans-1,3-Dichloropropene            | µg/L  | 29      | <0.5 U  | <0.5 U   | <0.5 U                                      | <0.5 U                                     | <0.5 U                                |         | <0.5 U  | <0.5 U   | <0.5 U                                     |
| Trichloroethene                      | µg/L  | 5       | <0.5 U  | <0.5 U   | <0.5 U                                      | 2.7  | <0.5 U                                |         | 17 J  | 17 J   | 3.1 J                                      |
| Trichlorofluoromethane               | µg/L  | 31000   | <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                       |       | 2       | <0.5 U  | <0.5 U   | <0.5 U                                      | 1.1  | <0.5 U                                |         | 5.7 J   | 5.6 J  | 42 J                                       |
| Volatile Fatty Acids (HPLC-METACIDS) |       |         |   |  |   |  |                                       |         |   |  |  |
| Acetic Acid                          | mg/L  | NV      | NA  | NA   | NA  | 140  | NA                                    |         | NA  | NA   | <2.0 U                                     |
| Butyric Acid                         | mg/L  | NV      | NA  | NA   | NA  | <1.0 U                                     | NA                                    |         | NA  | NA   | <1.0 U                                     |
| Lactic Acid                          | mg/L  | NV      | NA  | NA   | NA  | <1.0 U                                     | NA                                    |         | NA  | NA   | <1.0 U                                     |
| Propionic Acid                       | mg/L  | 51      | NA  | NA   | NA  | <1.0 U                                     | NA                                    |         | NA  | NA   | <1.0 U                                     |
| Pyruvic Acid                         | mg/L  | NV      | NA  | NA   | NA  | <0.10 U                                    | NA                                    |         | NA  | NA   | <0.10 U                                    |
| Anions (9056A)                       |       |         |   |  |   |  |                                       |         |   |  |  |
| Chloride                             | mg/L  | NV      | NA  | NA   | NA  | 868  | NA                                    |         | NA  | NA   | 1,770                                      |
| Nitrate                              | mg/L  | 10      | NA  | NA   | NA  | <0.500 U                                   | NA                                    |         | NA  | NA   | <0.500 U                                   |
| Sulfate                              | mg/L  | NV      | NA  | NA   | NA  | 1.62 J                                     | NA                                    |         | NA  | NA   | 2,560                                      |
| Dissolved Gases (RSK-175)            |       |         |   |  |   |  |                                       |         |   |  |  |
| Carbon Dioxide                       | µg/L  | NV      | NA  | NA   | NA  | 360,000                                    | NA                                    |         | NA  | NA   | 250,000                                    |
| Ethane                               | µg/L  | NV      | NA  | NA   | NA  | <0.47 U                                    | NA                                    |         | NA  | NA   | <0.47 U                                    |
| Ethene                               | µg/L  | NV      | NA  | NA   | NA  | <0.55 U                                    | NA                                    |         | NA  | NA   | 2.8  |
| Methane                              | µg/L  | NV      | NA  | NA   | NA  | 1,400                                      | NA                                    |         | NA  | NA   | 100  |
| Dechlorinating Bacteria              |       |         |   |  |   |  |                                       |         |   |  |  |

LHAAP-58 Remedial Action Operation Validated Data - December 2019

| Location ID:<br>Sample Date:  | Units    | MCL/MSC | 34AWW21_122019<br>12/20/19  | 34AWW21_122019-a<br>12/20/19   | 35AWW22_121819<br>12/18/19                  | 35AWW23_121819<br>12/18/19                 | 35AWW24_121919<br>12/19/19            | LHSMW04 | LHSMW06_122019<br>12/20/19  | LHSMW06_122019_a<br>12/20/19   | LHSMW07_121919<br>12/19/19                 |
|-------------------------------|----------|---------|---|--|---|--|---------------------------------------|---------|---|--|--|
| Location Description          |          |         | Site 58 - ESE,<br>outside site<br>boundary, beside<br>Building 725. | Site 58 - ESE,<br>outside site<br>boundary, beside<br>Building 725.<br>Duplicate | Site 58 - ENE,<br>outside site<br>boundary. | Site 58 - SW,<br>outside site<br>boundary. | Downgradient<br>Western Plume<br>well |         | Site 58 - SW,<br>inside site<br>boundary, beside<br>Building 715. | Site 58 - SW,<br>inside site<br>boundary, beside<br>Building 715.<br>Duplicate | Site 58 - SW,<br>outside site<br>boundary. |
| Location Depth                |          |         | Shallow   | Shallow  | Shallow                                     | Shallow                                    | Shallow                               |         | Shallow   | Shallow  | Shallow                                    |
| BAV1 Vinyl Chloride Reductase | cells/ml | NV      | NA  | NA   | NA  | 0.40 J                                     | NA                                    |         | NA  | NA   | 3.30                                       |
| Dehalobacter spp.             | cells/ml | NV      | NA  | NA   | NA  | < 5.6 U                                    | NA                                    |         | NA  | NA   | 5230                                       |
| Dehalococcoides               | cells/ml | NV      | NA  | NA   | NA  | 689  | NA                                    |         | NA  | NA   | 949.0                                      |
| tceA Reductase                | cells/ml | NV      | NA  | NA   | NA  | 29.6                                       | NA                                    |         | NA  | NA   | 0.20 J                                     |
| Vinyl Chloride Reductase      | cells/ml | NV      | NA  | NA   | NA  | 69.8                                       | NA                                    |         | NA  | NA   | 271  |
| Metals (SW6020)               |          |         |   |  |   |  |                                       |         |   |  |  |
| Arsenic                       | mg/L     | 0.01    | NA  | NA   | NA  | NA   | NA                                    |         | < 0.000500 U  | < 0.000500 U   | NA   |

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to disc

U - The analyte was not detected; however, the result is estimated due to discrepancies

Undetected: The analyte was analyzed for, but not detected.

NV - No Value

LHAAP-12 Year 12 Annual RA-O Sampling  
December 2019

| Location Code<br>Sample ID<br>Sample Date<br>Location Description |       |     | 12WW10R   |          | 12WW20  |          | 12WW21   |          |                  |          | 12WW22  |          | 12WW24  |          |
|---|-------|-----|---|----------|---|----------|--|----------|------------------|----------|---|----------|---|----------|
|   |       |     | 12WW10R-191203  |          | 12WW20-191203   |          | 12WW21-191203                                      |          | 12WW21-191203-FD |          | 12WW22-191203   |          | 12WW24-191203                                       |          |
|   |       |     | 12/3/2019   |          | 12/3/2019   |          | 12/3/2019  |          | 12/3/2019        |          | 12/3/2019   |          | 12/3/2019   |          |
|   |       |     | Shallow Zone,<br>Unimpacted, Outside<br>Site Boundary |          | Shallow Zone,<br>Unimpacted, Outside<br>Site Boundary |          | Shallow Zone, Unimpacted, Outside Site<br>Boundary |          |                  |          | Shallow Zone,<br>Unimpacted, Outside<br>Site Boundary |          | Shallow Zone,<br>Impacted, Outside Site<br>Boundary |          |
| Parameter   | Units | MCL | Result  | Val Qual | Result  | Val Qual | Result   | Val Qual | Result           | Val Qual | Result  | Val Qual | Result  | Val Qual |
| Volatile Organic Compounds by EPA Method 8260                     |       |     |   |          |   |          |  |          |                  |          |   |          |   |          |
| cis-1,2-Dichloroethene  | µg/L  | 70  | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5            | U        | < 0.5   | UJ       | 12  |          |
| Trichloroethene   | µg/L  | 5   | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5            | U        | < 0.5   | UJ       | 19  |          |
| Vinyl chloride  | µg/L  | 2   | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5            | U        | < 0.5   | UJ       | < 0.5   | U        |

Notes:  
Blue highlighting Indicates concentrations above the MCL  
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.  
MCL - Maximum Contaminant Limit  
ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1  
November 2019

| Location Code<br>Sample ID<br>Sample Date<br><br>Location Description |       |     | 35BWW01  |          | 35BWW04  |          |  |          | 35BWW05  |          | 35BWW07                                     |          | 35BWW08  |          | 35BWW09  |          |
|---|-------|-----|--|----------|--|----------|--|----------|--|----------|---|----------|--|----------|--|----------|
|   |       |     | 35BWW01-191121                                       |          | 35BWW04-191121                                     |          | 35BWW04-191121-FD                                  |          | 35BWW05-191125                                     |          | 35BWW07-191125                              |          | 35BWW08-191121                                       |          | 35BWW09-191126                                     |          |
|   |       |     | 11/21/2019   |          | 11/21/2019   |          | 11/21/2019   |          | 11/25/2019   |          | 11/25/2019                                  |          | 11/21/2019   |          | 11/26/2019   |          |
|   |       |     | Shallow zone,<br>unimpacted, within<br>site boundary |          | Shallow zone,<br>impacted, within site<br>boundary |          | Shallow zone,<br>impacted, within site<br>boundary |          | Shallow zone,<br>impacted, within site<br>boundary |          | Shallow zone,<br>unimpacted<br>downgradient |          | Shallow zone,<br>unimpacted, within<br>site boundary |          | Shallow zone,<br>impacted outside site<br>boundary |          |
| Parameter   | Units | MCL | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result   | Val Qual | Result                                      | Val Qual | Result   | Val Qual | Result   | Val Qual |
| Volatile Organic Compounds by EPA Method 8260                         |       |     |  |          |  |          |  |          |  |          |   |          |  |          |  |          |
| 1,1-Dichloroethene  | µg/L  | 7   | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                       | U        | < 0.5  | U        | < 0.5  | U        |
| cis-1,2-Dichloroethene  | µg/L  | 70  | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                       | U        | < 0.5  | U        | < 0.5  | U        |
| Tetrachloroethene   | µg/L  | 5   | < 0.5  | U        | 8.3  |          | 7.7  |          | 1.4  |          | < 0.5                                       | U        | < 0.5  | U        | < 0.5  | U        |
| Trichloroethene   | µg/L  | 5   | < 0.5  | U        | 0.93   | J        | 0.93   | J        | 6  |          | < 0.5                                       | U        | < 0.5  | U        | 47   |          |
| Vinyl chloride  | µg/L  | 2   | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                       | U        | < 0.5  | U        | < 0.5  | U        |

Notes:  
Blue Highlighting Indicates concentrations above the MCL/PCL  
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.  
MCL - Maximum Contaminant Limit  
ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1  
November 2019

| Location Code<br>Sample ID<br>Sample Date<br><br>Location Description |       |     | 35BWW10                                 |          | 35BWW11  |          | 35BWW12                                      |          | 35BWW13                                 |          | 35BWW14                                      |          | 35BWW15                                      |          |  |          |
|---|-------|-----|---|----------|--|----------|--|----------|---|----------|--|----------|--|----------|--|----------|
|   |       |     | 35BWW10-191126                          |          | 35BWW11-191121                                 |          | 35BWW12-191125                               |          | 35BWW13-191125                          |          | 35BWW14-191125                               |          | 35BWW15-191122                               |          | 35BWW15-191122-FD                            |          |
|   |       |     | 11/26/2019                              |          | 11/21/2019                                     |          | 11/25/2019                                   |          | 11/25/2019                              |          | 11/25/2019                                   |          | 11/22/2019                                   |          | 11/22/2019                                   |          |
|   |       |     | Shallow, impacted, within site boundary |          | Shallow zone, unimpacted, within site boundary |          | Shallow zone, impacted, within site boundary |          | Shallow zone, unimpacted, crossgradient |          | Shallow zone, impacted, within site boundary |          | Shallow zone, impacted, within site boundary |          | Shallow zone, impacted, within site boundary |          |
| Parameter   | Units | MCL | Result                                  | Val Qual | Result   | Val Qual | Result                                       | Val Qual | Result                                  | Val Qual | Result                                       | Val Qual | Result                                       | Val Qual | Result                                       | Val Qual |
| Volatile Organic Compounds by EPA Method 8260                         |       |     |   |          |  |          |  |          |   |          |  |          |  |          |  |          |
| 1,1-Dichloroethene  | µg/L  | 7   | < 0.5                                   | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                   | U        | 4.6  |          | 1.2  |          | 1.1  |          |
| cis-1,2-Dichloroethene  | µg/L  | 70  | < 0.5                                   | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                   | U        | 1.5  |          | < 0.5  | U        | < 0.5  | U        |
| Tetrachloroethene   | µg/L  | 5   | 0.84                                    | J        | < 0.5  | U        | 5.8  |          | < 0.5                                   | U        | 38   |          | 11   |          | 11   |          |
| Trichloroethene   | µg/L  | 5   | 0.9                                     | J        | < 0.5  | U        | 0.55   | J        | < 0.5                                   | U        | 16   |          | 7.8  |          | 7.6  |          |
| Vinyl chloride  | µg/L  | 2   | < 0.5                                   | U        | < 0.5  | U        | < 0.5  | U        | < 0.5                                   | U        | < 0.5  | U        | < 0.5  | U        | < 0.5  | U        |

Notes:  
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ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1  
November 2019

| Location Code<br>Sample ID<br>Sample Date<br><br>Location Description |       |     | 35BWW16   |          | 35BWW17  |          | 35BWW18   |          | 35BWW19   |          | 35BWW20  |          | 35BWW23   |          | 35BWW24   |          |
|---|-------|-----|---|----------|--|----------|---|----------|---|----------|--|----------|---|----------|---|----------|
|   |       |     | 35BWW16-191121                                      |          | 35BWW17-191121                                     |          | 35BWW18-191126  |          | 35BWW19-191126  |          | 35BMW20-191122                                     |          | 35BWW23-191125  |          | 35BWW24-191125  |          |
|   |       |     | 11/21/2019  |          | 11/21/2019   |          | 11/26/2019  |          | 11/26/2019  |          | 11/22/2019   |          | 11/25/2019  |          | 11/25/2019  |          |
|   |       |     | Shallow zone,<br>impacted, outside site<br>boundary |          | Shallow zone,<br>impacted, within site<br>boundary |          | Shallow zone,<br>unimpacted, outside<br>site boundary |          | Shallow zone,<br>unimpacted, outside<br>site boundary |          | Shallow sone,<br>impacted, within site<br>boundary |          | Shallow zone,<br>unimpacted, outside<br>site boundary |          | Shallow zone,<br>unimpacted, outside<br>site boundary |          |
| Parameter   | Units | MCL | Result  | Val Qual | Result   | Val Qual | Result  | Val Qual | Result  | Val Qual | Result   | Val Qual | Result  | Val Qual | Result  | Val Qual |
| Volatile Organic Compounds by EPA Method 8260                         |       |     |   |          |  |          |   |          |   |          |  |          |   |          |   |          |
| 1,1-Dichloroethene  | µg/L  | 7   | 0.75  | J        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        |
| cis-1,2-Dichloroethene  | µg/L  | 70  | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        |
| Tetrachloroethene   | µg/L  | 5   | 8.1   |          | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        | 15   |          | < 0.5   | U        | < 0.5   | U        |
| Trichloroethene   | µg/L  | 5   | 3.2   |          | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        | 3.1  |          | < 0.5   | U        | 1.8   |          |
| Vinyl chloride  | µg/L  | 2   | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5   | U        | < 0.5   | U        |

Notes:  
Blue Highlighting Indicates concentrations above the MCL/PCL  
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.  
MCL - Maximum Contaminant Limit  
ug/L - micrograms per liter

LHAAP-37 Year 3, Remedial Action - Operation Semiannual Sampling Event #1  
November 2019

| Location Code<br>Sample ID<br>Sample Date<br><br>Location Description |       |     | 35BWW25   |          |   |          | 35BWW26  |          | LHSMW58  |          |
|---|-------|-----|---|----------|---|----------|--|----------|--|----------|
|   |       |     | 35BWW25-191122                                      |          | 35BWW25-191122-FD                                   |          | 35BWW26-191121                                       |          | LHSMW58-191122                                     |          |
|   |       |     | 11/22/2019  |          | 11/22/2019  |          | 11/21/2019   |          | 11/22/2019   |          |
|   |       |     | Shallow zone,<br>impacted, outside<br>site boundary |          | Shallow zone,<br>impacted, outside<br>site boundary |          | Shallow zone,<br>unimpacted, within site<br>boundary |          | Shallow zone,<br>impacted, within site<br>boundary |          |
| Parameter   | Units | MCL | Result  | Val Qual | Result  | Val Qual | Result   | Val Qual | Result   | Val Qual |
| Volatile Organic Compounds by EPA Method 8260                         |       |     |   |          |   |          |  |          |  |          |
| 1,1-Dichloroethene  | µg/L  | 7   | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5  | U        |
| cis-1,2-Dichloroethene  | µg/L  | 70  | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5  | U        |
| Tetrachloroethene   | µg/L  | 5   | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | 4.2  |          |
| Trichloroethene   | µg/L  | 5   | 13  |          | 13  |          | < 0.5  | U        | < 0.5  | U        |
| Vinyl chloride  | µg/L  | 2   | < 0.5   | U        | < 0.5   | U        | < 0.5  | U        | < 0.5  | U        |

Notes:  
Blue Highlighting Indicates concentrations above the MCL/PCL  
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.  
MCL - Maximum Contaminant Limit  
ug/L - micrograms per liter



DEPARTMENT OF THE ARMY  
 LONGHORN ARMY AMMUNITION PLANT  
 POST OFFICE BOX 220  
 RATCLIFF, AR 72951

March 3, 2020

DAIN-ODB-LO

Mr. William Rhotenberry  
 U.S. Environmental Protection Agency  
 1201 Elm Street, Suite 500  
 Dallas, TX 75270-2002

**Re: Final Fifth Annual Remedial Action Operation Report, LHAAP-67, Aboveground Storage Tank Farm, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020**

Dear Mr. Rhotenberry,

One set of replacement pages and one compact disc (CD) of the above-referenced document are being transmitted to you for your records. There were no regulatory comments on the draft document, so the replacement pages consist of a replacement cover and text pages with the report version revised to "Final".

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

Rose M. Zeiler, Ph.D.  
 Longhorn AAP Site Manager

Copies furnished:

A. Palmie, TCEQ, Austin, TX (letter)  
 P. Bruckwicki, Caddo Lake NWR, TX (1 set replacement pages and 1 CD)  
 R. Smith USACE, Tulsa District, OK (1 set replacement pages and 1 CD)  
 A. Williams, USACE, Tulsa District, OK (1 CD)  
 A. Maly USAEC, San Antonio, TX (1 CD)  
 K. Nemmers, Bhate, Lakewood, CO (1 set replacement pages and 1 CD)  
 P. Srivastav, APTIM, Houston, TX (letter)





DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
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March 3, 2020

DAIN-ODB-LO

Ms. April Palmie  
Texas Commission on Environmental Quality,  
Superfund Section, MC-136  
12100 Park 35 Circle, Bldg D  
Austin, TX 78753

**Re: Final Fifth Annual Remedial Action Operation Report, LHAAP-67, Aboveground Storage Tank Farm, Longhorn Army Ammunition Plant, Karnack, Texas, March 2020**

Dear Ms. Palmie,

One set of replacement pages and one compact disc (CD) of the above-referenced document are being transmitted to you for your records. There were no regulatory comments on the draft document, so the replacement pages consist of a replacement cover and text pages with the report version revised to "Final".

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

A handwritten signature in dark ink, appearing to read "Rose M. Zeiler", is positioned above the typed name.

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

Copies furnished:

W. Rhotenberry, USEPA Region 6, Dallas, TX (letter)  
P. Bruckwicky, Caddo Lake NWR, TX (1 set replacement pages and 1 CD)  
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A. Williams, USACE, Tulsa District, OK (1 CD)  
A. Maly, USAEC, San Antonio, TX (1 CD)  
K. Nemmers, Bhate, Lakewood, CO (1 set replacement pages and 1 CD)  
P. Srivastav, APTIM, Houston, TX (letter)



*Final*  
Fifth Annual Remedial Action  
Operation Report, LHAAP-67  
(Aboveground Storage Tank Farm)  
Longhorn Army Ammunition Plant  
Karnack, Texas



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Task Order No. W9128BV17F0150  
Project No. 501032  
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March 2020

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## Acronyms and Abbreviations

|       |   |
|-------|---|
| µg/L  | micrograms per liter                          |
| DCA   | dichloroethane                                |
| DCE   | dichloroethene                                |
| AECOM | AECOM Technical Services, Inc.                |
| APTIM | Aptim Federal Services, LLC                   |
| AST   | aboveground storage tank                      |
| bgs   | below ground surface                          |
| Bhate | Bhate Environmental, Inc.                     |
| COCs  | contaminants of concern                       |
| DHC   | <i>Dehalococcoides Sp.</i>                    |
| DO    | dissolved oxygen                              |
| J     | estimated value                               |
| LHAAP | Longhorn Army Ammunition Plant                |
| LUCs  | land use controls                             |
| MATOC | Multiple Award Task Order Contract            |
| MCL   | maximum contaminant level                     |
| MEGA  | Multiple Environmental Government Acquisition |
| mg/L  | milligrams per liter                          |
| MMRP  | Military Munitions Response Program           |
| MNA   | monitored natural attenuation                 |
| mV    | millivolts                                    |
| No.   | number  |
| ORP   | oxidation-reduction potential                 |
| RACR  | Remedial Action Completion Report             |
| RA-O  | remedial action operation                     |
| RAWP  | Remedial Action Work Plan                     |
| ROD   | Record of Decision                            |
| RD    | Remedial Design                               |
| Shaw  | Shaw Environmental & Infrastructure, Inc.     |
| SU    | standard unit                                 |
| TCA   | trichloroethane                               |
| TCE   | trichloroethene                               |
| TCEQ  | Texas Commission on Environmental Quality     |

## Acronyms and Abbreviations *(continued)*

|       |                                      |
|-------|--------------------------------------|
| TOC   | total organic carbon                 |
| USACE | U.S. Army Corps of Engineers         |
| USEPA | U.S. Environmental Protection Agency |
| VOC   | volatile organic compound            |

FIFTH ANNUAL REMEDIAL ACTION OPERATION REPORT, LHAP-67 (ABOVE-GROUND STORAGE TANK FARM)

## 1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Tulsa District, contracted with Bhate Environmental, Inc. (Bhate) under the Omaha Multiple Environmental Government Acquisition (MEGA) National Small Business Multiple Award Task Order Contract (MATOC), Environmental Remediation Services with Military Munitions Response Program (MMRP), Task Order Number (No.) W9128BV17F0150, to conduct environmental restoration at multiple sites at the former Longhorn Army Ammunition Plant (LHAAP). The Bhate Team is comprised of Bhate and Aptim Federal Services, LLC (APTIM).

A Final Record of Decision (ROD) was executed for LHAAP-67 in June 2010 (USACE 2010). Groundwater monitoring at LHAAP-67 is ongoing as described in the Draft Final Remedial Action Completion Report (RACR) (AECOM 2015). This remedial action operation (RA[O]) report represents the fifth year of RA-O implementation and summarizes the results of site inspections and sampling activities completed between August 2018 and August 2019. The draft first year RA-O report was prepared in March 2015. The fourth year RA-O report, which covered the period between November 2017 and July 2018, was prepared in January 2019. This report encompasses and provides analysis for five years of monitored natural attenuation (MNA) data.

LHAAP is located in east Texas in the northeastern corner of Harrison County between State Highway 43 in Karnack, Texas, and the western shore of Caddo Lake (see **Figure 1-1**). The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east. Caddo Lake is a large freshwater lake that bounds LHAAP to the north and east. The eastern fence of the LHAAP installation is 3.5 miles from the Texas-Louisiana state border.

### 1.1 Remedial Action Objectives

The remedial action objectives at the LHAAP-67 site must protect human health and meet applicable or relevant and appropriate requirements. There are no ecological risks at the LHAAP-67 site (USACE 2010).

The remedial action objectives for the LHAAP-67 site, consistent with the reasonably anticipated future use as a national wildlife refuge, are:

- Protection of human health by preventing human exposure to the contaminated groundwater
- Protection of human health and the environment by preventing contaminated groundwater from migrating into nearby surface water

- Return of groundwater to its potential beneficial use as drinking water, wherever practicable

## 1.2 Performance Objectives

The remedy selected for LHAAP-67 is land use control (LUC) and MNA. The performance objectives at LHAAP-67 consist of two components: 1) physical inspections and 2) groundwater/surface water monitoring. As a component of the LUC implementation, the civil survey of the LUC boundary was conducted in November 2014 and recorded in the Harrison County Courthouse in December 2014. Physical inspections are conducted periodically to confirm compliance with the LUC objectives, which consist of preventing human exposure to groundwater contamination presenting an unacceptable risk to a future maintenance worker and ensuring that there is no withdrawal or use of groundwater from the site for anything other than environmental monitoring and testing until the cleanup levels are attained. Groundwater monitoring has been in-progress at the site since May 2013, and LHAAP-67 was included as part of the site wide Final Fourth Five Year Review Report finalized in May 2019 (USACE 2019).

According to the Remedial Design (RD), groundwater monitoring is being performed to demonstrate that natural attenuation is an effective remedy that will attain the remediation objectives over time and that the groundwater plume will not migrate to nearby surface water bodies at levels that may present an unacceptable risk to human health and the environment (Shaw 2011). Groundwater monitoring is being performed in accordance with the Remedial Action Work Plan (RAWP) (AECOM 2013) to:

- Detect changes in environmental conditions that may reduce the efficacy of natural attenuation processes
- Identify potentially toxic and/or mobile transformation products
- Verify that the plume is not expanding and poses no unacceptable risk to downgradient receptors
- Detect new releases of contaminants to the environment that could impact effectiveness of the natural attenuation remedy
- Verify attainment of the remediation objectives

Work completed as part of the 2018/2019 RA-O consisted of the following:

- October 2018 groundwater monitoring event consisting of 15 wells
- May 2019 groundwater monitoring event consisting of 15 wells



- LUC inspection
- July-August 2019 Monitoring Well Installation
- Well Maintenance Activities

This report summarizes the LUC compliance inspection, results of groundwater sampling, and an evaluation of MNA.

### 1.3 Site Description

LHAAP-67 is in the central portion of LHAAP, as shown on **Figure 1-2**, and covers an area of approximately 1.9 acres. The site topography is relatively flat. The nearest significant surface water body is Central Creek located approximately 870 feet southeast of LHAAP-67. Central Creek eventually flows into Caddo Lake.

When operational, LHAAP-67 consisted of seven aboveground storage tanks (ASTs) used for storing No. 2 fuel oil, kerosene, and solvents. The size of the tanks is unknown. The tanks were surrounded by earthen dikes designed to contain potential spills. The ASTs have been removed and the only structure remaining at the site is a railroad bed.

The LUC area associated with the groundwater use restriction at LHAAP-67 extends beyond the historical site boundaries along the western, eastern, and southern sections of the site, and encompasses a total of 2.6 acres. LHAAP-67 has no known areas of archaeological or historical importance.

### 1.4 Conceptual Site Model

A detailed Conceptual Site Model of LHAAP-67 was previously presented in the ROD (USACE 2010). Based upon additional data collected as part of final remedy implementation as presented in the LHAAP-67 Final RACR (AECOM 2016), the lithologic units at the site have been reclassified.

Historically, two distinct water-bearing zones (shallow and intermediate) had been designated at LHAAP-67; however, during drilling performed for the 2013 investigation, no continuous clay layer (i.e., aquitard) or significant lithological differences between previously identified shallow and intermediate zones were encountered. Co-located monitoring wells 67WW06 (total depth 47.55 feet below ground surface [bgs]) and 67WW07 (total depth 24.0 feet bgs), historically identified as intermediate and shallow zone wells, respectively, had similar static groundwater levels during the four sampling events performed during 2013/2014, with a maximum difference of 1.04 feet noted during the January 2014 event (these small differences were confirmed in the four 2014/2015 sampling events with a maximum difference of 0.08 feet. Therefore, the previously designated shallow and intermediate zones are now

considered to be hydraulically connected and constitute a single uppermost groundwater-bearing unit at LHAAP-67 to a depth of approximately 50 feet bgs. Monitoring well 67WW06, which was previously identified as an intermediate zone well, has been re-classified as a shallow zone monitoring well, screened in the uppermost groundwater-bearing unit. A deeper “intermediate” water-bearing zone was identified at a depth of approximately 68 feet bgs in boring 67DPT14 (drilled in June 2014) with a clear aquitard separating this unit from the shallow zone. To assess the deeper “intermediate” water-bearing zone, 67WW16I was installed in May 2016. Based on this information, shallow and intermediate water-bearing zones are present in the LHAAP-67 investigation area, but the configuration has been modified from that presented in the RD as discussed above.

The contaminants of concern (COCs) identified in the ROD for LHAAP-67 shallow zone groundwater are trichloroethene (TCE), 1,1-dichloroethene (DCE), 1,2-dichloroethane (DCA), 1,1,1-trichloroethane (TCA), and 1,1,2-TCA. It is also noted that vinyl chloride, a degradation product of TCE, was detected again during the fifth year RA-O period at 67WW01 in May 2019, however it was below the maximum contaminant level (MCL) of 2 micrograms per liter ( $\mu\text{g/L}$ ). The presence of these COCs in the shallow groundwater zone represents the primary driver for remedial action as they are at concentrations above the human health standard for a hypothetical future maintenance worker under an industrial exposure scenario. No COCs were detected in 67WW16I in May 2016, November 2017, May 2018, October 2018, or May 2019 confirming the June 2014 results from temporary well 67DPT14 and indicating that COCs are confined to the shallow groundwater zone.

The nature and extent of groundwater contamination at LHAAP-67 was evaluated during field investigations conducted between 1998 and 2007. It is believed that historic releases from the ASTs at the site contaminated the soil, with contaminants then leaching from the soil into groundwater. A relatively small area of contamination is observed in the shallow groundwater which poses an unacceptable carcinogenic risk and non-carcinogenic hazard to a hypothetical future maintenance worker under an industrial exposure scenario. There is no groundwater contamination in the deeper “intermediate” groundwater zone. The only potentially complete exposure pathway is via use of shallow groundwater zone as drinking water. However, shallow groundwater is not used as drinking water at the refuge and the pathway is eliminated from any hypothetical receptor because LUCs are in place that prohibits the use of groundwater other than for environmental monitoring and testing. The nearest significant surface water body to LHAAP-67 site is Central Creek, located upgradient and approximately 870 feet from the site as shown on **Figure 1-2**. There is no other surface water body in close proximity to the LHAAP-67 site. Therefore, there is not a complete pathway from groundwater to surface water.

The 1<sup>st</sup> Annual RA-O report indicated that the dominant shallow zone groundwater gradient appeared to be to the north/northeast, but the flow direction began to shift direction by May 2014 towards the north/northwest and continued to show a north/northwesterly flow direction. Based on groundwater level data collected 2015 through 2019, the dominant shallow zone groundwater gradient appears to be to the north/northwest. The apparent change of the shallow zone groundwater gradient may be due to the increase in precipitation the area received during the current monitoring period (i.e., 2015/2016) (particularly in 2015) and the resulting rise in groundwater levels. The historical gradient was originally assumed to be to the southeast in the Final RD (Shaw 2011) and was based on data collected primarily from three monitoring wells because some of the wells such as 67WW03 and 67WW04 were dry most of the time. Therefore, because the groundwater is flowing away from Central Creek at LHAAP-67, the potential discharge to surface water in Central Creek became an incomplete exposure pathway and surface water sampling as stated in the RAWP and RACR was deemed no longer necessary (AECOM 2013 and 2016).

To assess the deeper “intermediate” water-bearing zone, monitoring well 67WW16I was completed to a depth of 78 feet bgs. This well was sampled in May 2016, November 2017, May 2018, October 2018, and May 2019 and no COCs were detected. This sampling confirms that COCs are confined to the shallow zone groundwater.

In response to the *Fourth Five-Year Review Report* (USACE 2019) recommendation to “evaluate data in the north area of the plume to determine if temporary exceedances indicate plume migration or require extension of the plume boundary monitoring well system”, two new monitoring wells (67WW17 and 67WW18) were installed in the shallow groundwater zone in July and August 2019. The well installations are discussed further in **Section 2.5**.

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • March 2020

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## 2.0 SITE ACTIVITIES AT LHAAP-67

This section describes the results of the Year 5 RA-O activities including annual LUC compliance inspection, semiannual groundwater monitoring, monitoring well installation, and monitoring system repairs and/or maintenance performed at LHAAP-67.

### 2.1 Annual LUC Compliance Inspection

The annual LUC compliance inspection for LHAAP-67 was performed on 14 Aug 2019. The LUC for this site is groundwater restriction, which prohibits water well installation for any purpose other than environmental monitoring and testing; and residential groundwater use until the levels of COCs in groundwater and soil allow unrestricted use and unlimited exposure. The restriction applies to groundwater underlying an approximately 6-acre area defined by the surveyed LUC boundary (AECOM 2016). The Annual LUC Compliance Certification Documentation Form for the Year 5 RA-O monitoring period is included in **Appendix A**. No non-compliance issues or concerns were noted during the annual inspection.

### 2.2 Groundwater Monitoring

The Year 5 RA-O monitoring is the third of three years of semiannual monitoring. Two groundwater sampling events were completed in October 2018 and May 2019 and are reported here. Sample Collection Logs are included in **Appendix C**. Sampling was attempted at 15 monitoring wells during each of the sampling events (October 2018 and May 2019) as shown on **Table 2-1**. Monitoring well locations are depicted in **Figure 2-1**.

Prior to collecting groundwater samples, monitoring wells were gauged using a water level probe, and the depth-to-water was recorded to the nearest 0.01 feet from the top of casing. Depth-to-water measurements were used to calculate the groundwater elevations presented in **Table 2-2**. Monitoring wells 67WW01 and 67WW03 were gauged for water level in October 2018, however there was insufficient water to collect groundwater samples. In May 2019 monitoring well 67WW03 was dry and could not be gauged or sampled.

Water samples were collected using low-flow sampling techniques as described in the groundwater sampling procedures found in the *Final Installation-Wide Work Plan* (Bhate 2018).

#### 2.2.1 Approved Modifications to the Groundwater Monitoring Program

Minor modifications have been made to the groundwater monitoring program, in coordination with U.S. Environmental Protection Agency (USEPA) and the Texas Commission on Environmental Quality (TCEQ), since it was first developed in the RAWP (AECOM 2013).

- Monitoring wells 67WW09A and 67WW10 replaced the sampling of 67WW04 to bound the plume to the south.
- 67WW04 will continue to be gauged for water levels only during each sampling event.
- Monitoring wells 67WW06 and 67WW07 are now considered duplicative and only 67WW07 will be sampled in the future.
- 67WW06 will continue to be gauged for water levels only during each sampling event.
- Monitoring wells 67WW01 and 67WW08 were selected in the RAWP for collection of MNA geochemical parameters. Based on the presence of groundwater and an evaluation of COC concentrations and monitoring well locations with respect to the plume, it was determined in coordination with USEPA and TCEQ that future sampling for MNA geochemical parameters will occur at monitoring well 67WW13 in addition to 67WW08.
- No further surface water monitoring is planned for the LHAAP-67 site at Central Creek (AECOM 2016).

## 2.2.2 Groundwater Elevations and Flow Direction

During the Year 5 RA-O sampling events, water levels were gauged in October 2018 and May 2019 and used to determine groundwater flow direction, as shown on **Figures 2-2** and **2-3**. In May 2019 monitoring wells 67WW03 and 67WW04 were dry, however this did not limit the ability to construct a potentiometric surface contour map. Based on the gauging data during this event, the groundwater flow direction is interpreted to be north/northwesterly.

The groundwater elevations across the site during the Years 2, 3, 4, and 5 RA-O sampling events remained similar with the predominant groundwater flow direction in a north/northwesterly direction.

## 2.2.3 Groundwater Monitoring and Analytical Results

Semi-annual groundwater samples were collected and analyzed for volatile organic compounds (VOCs) according to SW-846 Method 8260. During the October 2018 sampling event, there was insufficient water to collect a sample for analysis at monitoring wells 67WW01 and 67WW03. In May 2019, 67WW03 was dry and a sample was not collected for analysis. Samples were also collected from 67WW08 and 67WW13 and analyzed for MNA geochemical parameters (**Table 2-1**).

During the fifth semi-annual RA-O sampling events, monitoring wells 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15, contained VOCs above their respective MCLs in one or both sampling events. The highest concentrations of VOCs were detected in wells 67WW01 and 67WW15, which are cross-gradient to each other. Analytical results for the fifth semi-annual RA-O period are presented in **Table 2-3** and **Table 2-4**. **Table 2-3** presents the VOC and MNA data from the two semiannual events from RA-O Year 5, while **Table 2-4** presents the data from the first through the fifth annual events. Historical COC results are presented in **Table 2-5**. **Figures 2-4** and **2-5** depict the VOC data in wells sampled in October 2018 and May 2019, respectively. The trends of COC concentrations in monitoring wells with COC concentrations greater than the MCL are depicted in graphs presented on **Figure 2-6**. An expanded discussion on the VOCs and their distribution including trend analysis is included **Section 3.1**.

Groundwater monitoring well sampling forms for the October 2018 and May 2019 sampling events were completed for each monitoring well sampled and are included in **Appendix C**. Laboratory analytical results are included in **Appendix D**.

## 2.3 Surface Water Sampling

Surface water monitoring is not required for LHAAP-67, based on the change in the groundwater flow direction, and with TCEQ and USEPA concurrence. The current north/northeast groundwater flow direction indicates that Central Creek, located south of the LHAAP-67 site, is upgradient from the site and surface water monitoring continues to be unnecessary.

## 2.4 Groundwater Monitoring System Maintenance

Inspections of the conditions/integrity of monitoring wells are conducted during each sampling event and the information is recorded on the field sampling forms. **Appendix B** includes a photo log, which shows the condition of the wells in October 2018 and May 2019. Maintenance or repairs are performed as needed, based on observed conditions. During the Year 5 reporting period, no damage to well bollards, pads, or protective well casings was observed. Also, only minimal encroachment of weeds or brush on the well pads was observed. Mowing the area to control brush and weeds is conducted on a routine basis as needed to allow access to the wells, and was conducted at LHAAP-67 on 29 Apr 2019. **Table 2-6** provides a summary of the maintenance activities that were performed at the site during the Year 5 RA-O period.

## 2.5 Groundwater Monitoring Optimization

In accordance with the recommendation in the Fourth Five Year Review Report (USACE 2019), two monitoring wells (67WW17 and 67WW18) were installed to the north and northwest of the site to evaluate the extent of the plume boundary in those directions. The wells

were installed as 4-inch-diameter PVC wells with 10-foot screens using a hollow-stem auger drilling rig. The screened intervals were selected based on the conditions observed during drilling and to match the depth of the interval screened in the nearby wells where recent analytical exceedances had been observed. Monitoring well 16WW17 was installed at 27 feet below ground surface (bgs) with a screened interval from 17 to 27 feet to match the shallow screened interval in well 67WW02, while well 16WW18 was installed at 39 feet bgs with a screened interval from 29 to 39 feet bgs to match the screened interval in well 67WW15. Boring logs for the newly installed wells are included in **Appendix C**. The wells were developed in accordance with the Final Installation-Wide Work Plan (IWWP) (Bhate 2018) and will be sampled during the next RA-O sampling event in October 2019. The analytical results from those samples will be used to determine if there is a need to adjust the RA-O monitoring network. No additional changes are recommended to the groundwater-monitoring program for the Year 5 RA-O sampling event. The monitoring well network for Year 6 RA-O sampling is presented in Table 2-7. In accordance with the RAWP (AECOM 2013), since the 3-year semiannual LTM period has been completed, monitoring will be conducted annually beginning in October 2019 until the next Five Year Review.



### 3.0 NATURAL ATTENUATION EVALUATION

The following sections present the results of the natural attenuation evaluation in accordance with the three lines of evidence discussed in the Final RD (Shaw 2011) for site COCs.

#### 3.1 First Line of Evidence: Change in COC Concentrations

Natural attenuation is the combination of multiple mechanisms, including biodegradation, volatilization, dilution, advection, and absorption that reduce contaminant concentrations. The decrease of COC concentrations over time and distance is evidence of natural attenuation. The change in groundwater COC concentrations over time and with distance was evaluated at LHAAP-67. COC concentrations for the October 2018 and May 2019 sampling events are provided on **Figures 2-4** and **2-5** as well as **Tables 2-3** and **2-4**. COCs exceeding their respective MCLs are highlighted. To aid in evaluating COCs over time, concentration trends are provided on **Figure 2-6**.

Based on the general direction of groundwater flow, monitoring wells 67WW04, 67WW09A, and 67WW10 are considered upgradient background monitoring wells and monitoring wells 67WW12, 67WW02, and 67WW05 can be considered downgradient monitoring wells. In-plume monitoring wells include 67WW01, 67WW08, 67WW09, 67WW11, 67WW13, 67WW15, and 67WW16. Monitoring wells 67WW07 and 67WW14 are considered cross-gradient wells. In the Year 5 RA-O event, five monitoring wells had COC concentrations above the MCL: 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15. During the Year 5 RA-O period, the COCs at 67WW11 have remained below the MCL since the Year 4 RA-O period in November 2017.

After the Year 5 RA-O sampling events, the newer well 67WW15 now has enough data points in the trend to run the Mann-Kendall analysis, along with the four previously evaluated wells. The following discusses the observations and trends for the monitoring wells with COC concentrations above the MCL.

Mann-Kendall analysis for the Year 5 RA-O monitoring period was completed for 1,1-DCE, 1,2-DCA, and 1,1,2-TCA. The results are presented in **Appendix E** in graphical format with statistical results presented on the bottom of the page. The GSI Mann-Kendall Tool Kit was used for this analysis. The concentrations of COCs are presented in µg/L. Half the reporting limit was used for non-detect values. For locations with field duplicate samples, the primary sample concentration was used in the trend analysis. The level of significance is calculated for each analysis and is provided on the trend analysis sheet. A summary table of the Mann-Kendall results is provided on **Table 3-1**. Historical COC results for all wells are present in **Table 2-5**.

### Significant Decreases

Mann-Kendall analysis identified statistically significant evidence of decreasing trends at the following:

- **Monitoring well 67WW08—1,2-DCA.** Concentrations of 1,2-DCA have fluctuated since 2013 and decreased to 5.1 µg/L in May 2019. These decreasing trends may be the result of natural attenuation (e.g., dilution from clean upgradient groundwater). The 1,1-DCE concentrations are not significantly decreasing but were probably decreasing as they have decreased from 940 µg/L in 2013 to 110 µg/L in May 2019. Results from future sampling events will continue to be evaluated for COC concentration trends.

Concentrations of 1,1-DCE in samples from well 67WW11 have remained below the MCL during Year 4 and Year 5 RA-O sampling events; therefore, Mann-Kendall analysis was not conducted for this well.

### Significant Increases

Mann-Kendall analysis identified statistically significant evidence of increasing trends at the following wells:

- **Monitoring well 67WW01—1,1-DCE and 1,2-DCA.** Historically, 1,1,1-TCA and 1,1,2-TCA were detected above the MCL at this well along with their degradation daughter products 1,1-DCE and 1,2-DCA. The initial increase in 1,1-DCE and 1,2-DCA indicates that degradation is occurring as expected. Since 2016, 1,1,1-TCA and 1,1,2-TCA have been reduced to or near non-detect levels, and 1,1-DCE and 1,2-DCA have been decreasing. Although the Mann-Kendall analysis indicates increasing trends, the concentrations have been decreasing since the highest levels were observed in 2016.
- **Monitoring well 67WW02—1,1-DCE.** During the fifth year RA-O period, 1,1-DCE concentration increased from 6.9 µg/L in October 2018 to 180 µg/L in May 2019. This is a slight decrease from 190 µg/L concentration detected in May 2018. Since February 2015, concentrations have increased from below the MCL to levels above and have fluctuated, in an increasing trend (**Figure 2-6**). The concentration detected in October 2018 is the highest concentration of 1,1-DCE detected at this monitoring well to date. Results from future sampling events will continue to be evaluated for COC concentration trends.

- **Monitoring well 67WW13—1,2-DCA.** Over the five-year RA-O period, 1,2-DCA concentrations at 67WW13 have remained stable with 23.1 µg/L in May 2013 and 24 µg/L in May 2019. 1,1-DCE continues to be stable at this well with no statistical trend and only an 84.8% confidence.

### **Stable/No Trend**

Mann-Kendall analysis identified a trend as either stable or no trend at the following:

- **Monitoring well 67WW15—1,1-DCE, 1,2-DCA, and 1,1,2-TCA.** Concentrations of 1,1-DCE have decreased since 2016 from 2,460 µg/L to 330 µg/L in May 2019. However, the COC concentrations have fluctuated between 510 µg/L and 330 µg/L between 2017 and May 2019 and statistically there is no trend. Concentrations of 1,2-DCA and 1,1,2-TCA have also decreased since the first sampling event in 2016, however the overall trends show that the data is stable. The Mann-Kendall analysis indicates that the groundwater contaminant plume in the vicinity of monitoring well 67WW15 continues to be stable.
- **Monitoring well 67WW13—1,1-DCE.** Over the five-year RA-O period, changes in 1,1-DCE concentrations show no statistical trend, indicating that the groundwater contaminant plume in the vicinity of 67WW13 is stable.

At monitoring well 67WW14, 1,1-DCE, and 1,2-DCA were above the detection limits only during the 3<sup>rd</sup> year RA-O sampling events, suggesting that the plume may be expanding to the west. However, these constituents have been below their respective MCLs during the Year 4 and Year 5 RA-O sampling events and are not increasing over time.

### **3.1.1 Predictive Modeling**

During the Year 3 RA-O sampling event, statistically significant decreases were observed at 67WW09 and 67WW11, using Mann-Kendall analysis for 1,1-DCE and 1,2-DCA. All COCs at these two wells were below the MCL during the Year 5 RA-O sampling, indicating the MNA processes are reducing concentrations at LHAAP-67.

As previously noted in **Section 3.1**, the Mann-Kendall analysis was used to determine that a statistically significant decrease in concentration over time was observed at monitoring well 67WW08 for 1,2-DCA. To determine the estimated time to achieve the MCL, a time-dependent attenuation rate was determined and is provided in **Appendix F**. The first order rate constant was estimated at 0.001 day<sup>-1</sup> and the time to achieve the MCL of 5 µg/L, from 5.1 µg/L

observed in May 2019, is estimated to be 0.1 years. A significant decrease in COCs is not occurring in other wells and therefore degradation rates cannot be calculated to determine a time to achieve the MCL for the plume (i.e., predictive modeling by assuming some degree of degradation and degradation half-lives is not meaningful for this plume).

### 3.1.2 Plume Stability

Plume maps for the two Year 5 RA-O sampling events are presented in **Figures 2-4 and 2-5**. 1,1, 2-TCA, 1,1-DCE and 1,2-DCA are the most widespread COCs in the shallow groundwater. The COC data from the RA-O monitoring indicate that the plume is migrating north/northwest, in the direction of groundwater flow.

Even though the overall plume is relatively stable, the Mann-Kendall indicates a significant increasing trend for 1,1-DCE at downgradient monitoring well 67WW02 since the beginning of the RA-O period. The highest 1,1-DCE concentration at 67WW02 was detected in May 2019 at 180 µg/L. At this well, a pattern of annual fluctuations has been observed since 2017 where the COCs are below the MCLs in the fall and then rebound to levels above the MCL in the spring. However, there does not seem to be a correlation between COC concentrations and groundwater elevations. These data may suggest plume migration towards monitoring well 67WW02 from in-plume monitoring wells 67WW01, 67WW08, and 67WW15. Monitoring well 67WW05, downgradient of monitoring well 67WW15, continues to be non-detect for the site COCs, and therefore, defines the northwest downgradient extent of COCs of the site plumes. At monitoring well 67WW12 located on the east side in the downgradient direction, COCs have not been detected above the MCL.

In-plume monitoring well 67WW15 indicates COC trends are stable indicating that the plume is not migrating to the west and abiotic natural attenuation processes, including dilution from upgradient clean groundwater, may be decreasing COC levels.

Monitoring well 67WW13, located downgradient from monitoring well 67WW15, exhibited a stable trend for 1,1-DCE and an increasing trend for 1,2-DCA. Similar to monitoring well 67WW15, monitoring well 67WW13 remains bounded by downgradient monitoring well 67WW05 where COCs have not been detected above MCLs.

At cross-gradient monitoring well 67WW14, located in the southwestern quadrant, COCs were observed above their respective MCLs once during the Year 3 RA-O. Concentrations have been below the MCL during the Year 4 and Year 5 RA-O sampling events, indicating that the plume is not expanding to the southwest. Cross-gradient monitoring well 67WW07 also has concentrations below the MCLs over the five year RA-O period.

Based on the general direction of groundwater flow, the COCs in upgradient monitoring wells 67WW04, 67WW09A and 67WW10 have remained below the MCLs.

As detailed above, concentration data from monitoring well 67WW02 may suggest that the plume is migrating in the direction of groundwater flow. Based on recommendations of the 2019 Five Year Review, two additional wells (67WW17 and 67WW18) were installed in July-August 2019 to determine if contaminants are migrating to the north and northwest as shown on **Figure 3-1**.

### 3.2 Second Line of Evidence: Geochemical Indicators

**Tables 2-3** and **2-4** include the geochemical indicators that are useful MNA evaluation parameters. Some geochemical indicators are collected in the field and are recorded for all sampling events for all wells. In February 2019 the *Final Technical Memorandum – Monitored Natural Attenuation Monitoring Parameters* (Bhate 2019) updated the list of geochemical parameters to reduce redundancy. The updated list of parameters collected at LHAAP-67 is reflected in **Tables 2-3** and **2-4**. The full list of parameters analyzed for the MNA evaluation were collected at two wells 67WW08 and 67WW013. The field parameters for LHAAP-67 wells include dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, conductivity, turbidity, ferrous iron, and temperature.

#### Dissolved Oxygen

DO is the most thermodynamically favored electron acceptor used by microbes for biodegradation of organic carbon, whether natural or anthropogenic (USEPA 1998). Anaerobic bacteria, which are the primary microbes able to degrade the site COCs, generally cannot function at DO concentrations greater than about 0.5 milligrams per liter (mg/L) and hence, reductive dechlorination may not occur.

Monitoring wells 67WW01, 67WW02, 67WW08, 67WW13, and 67WW15 were evaluated because COC concentrations are greater than the MCL. The DO concentrations ranged from 0.08 mg/L to 2.85 mg/L during the Year 5 RA-O sampling events, with 6 of the 9 readings below the 0.5 mg/L threshold. The DO levels of 0.50 mg/L or less observed in these impacted wells are favorable for reductive dechlorination.

#### Oxidation Reduction Potential

The ORP levels indicate the oxidative or reductive potential in the aquifer matrix and provide real-time data to determine if conditions are conducive for anaerobic biodegradation. ORP values less than 50 millivolts (mV) indicate that anaerobic conditions are present in the aquifer and are favorable for biological reductive dechlorination of chlorinated ethenes and ethanes.

During the Year 5 RA-O monitoring period, the ORP measurements have generally been positive in all wells. Specifically, in monitoring wells 67WW08, 67WW13, and 67WW15, ORP values have been greater than 50 mV ranging from 73 mV to 281 mV. These measurements indicate oxidative conditions which are not favorable for reductive dechlorination.

### **Nitrate**

After DO has been depleted by microbes in the treatment zone, nitrate may be used as an electron acceptor for the degradation of organic carbon via denitrification and is reduced to nitrite. Nitrate levels above 1.0 mg/L may compete with reductive dechlorination (USEPA 1998). Nitrate was analyzed at monitoring wells 67WW08 and 67WW13 in October 2018 and May 2019. Nitrite was analyzed only during the October 2018 sampling event, and then was removed per the Technical Memorandum (Bhate 2019). The nitrate concentrations were below 1 mg/L and will not compete as a respiratory substrate with site COCs.

### **Iron Reduction**

After nitrate, iron (III) (ferric iron) is used as an electron acceptor during anaerobic biodegradation of organic carbon. During this process, iron (III) is reduced to iron (II) (ferrous iron), which is soluble in water. Therefore, an increase in ferrous iron can indicate reducing groundwater conditions. During the Year 4 RA-O sampling, ferrous iron was detected at low levels and ranged from 0.04 to 0.063 mg/L. During the Year 5 RA-O sampling, ferrous iron ranged from below the detection limit to 0.343 mg/L. An increase in ferrous iron was not observed and does not indicate that reducing conditions are present in the groundwater.

### **Sulfate**

After DO, nitrate, and iron have been depleted in the groundwater, sulfate is used as an electron acceptor and is reduced to sulfide. Concentrations of sulfate greater than 20 mg/L may compete with reductive dechlorination of the site COCs. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs (USEPA 1998). Sulfate was sampled at monitoring wells 67WW08 and 67WW13 during the Year 5 RA-O and ranged from 284 mg/L to 499 mg/L. Relatively high concentrations of sulfate and corresponding low sulfide concentrations in October 2018 indicate that sulfate-reducing conditions do not exist, and the aquifer is not conducive for sulfate reduction.

## **Methane**

Methanogenesis occurs in highly reducing conditions and generally occurs after oxygen, nitrate, iron, and sulfate have been depleted. Methane levels above 500 µg/L are considered indicative of methanogenic conditions (USEPA 1998). Methane concentrations were less than 5.5 µg/L during the Year 5 RA-O at 67WW08 and 67WW13 and suggest that methanogenic conditions are not present in the groundwater.

## **Total Organic Carbon**

Regardless of the electron acceptor being used, organic carbon is a required source of reduced carbon and energy to sustain microbial activity. Total organic carbon (TOC) is utilized as an energy and hydrogen source to support the reductive dechlorination of the chlorinated COCs. TOC concentrations greater than 20 mg/L are considered adequate to support microbial activity (USEPA 1998).

TOC was analyzed in monitoring wells 67WW08 and 67WW13 during the Year 5 RA-O sampling events and ranged from 2.09 mg/L to 3.99 mg/L. This data indicates that carbon concentrations in the groundwater are not supportive of reductive dechlorination.

## **pH**

The pH of the groundwater has an effect on the activity of microbial populations. Microbes capable of degrading chlorinated aliphatic hydrocarbons generally prefer pH values from 6 to 8 standard units (SU) (USEPA 1998). The shallow zone groundwater pH within the plume during the Year 5 RA-O period ranged from 5.43 SU (67WW15) to 6.5 SU (67WW01), with an average of value of 5.87 SU. The pH levels in these wells are marginal for dechlorinating bacteria.

## **Ethene and Ethane**

Ethane and ethene are the end products of the reductive dechlorination pathways for chlorinated ethanes and ethenes. During the Year 5 RA-O, 67WW08 and 67WW13 were analyzed for ethene and ethane, and concentrations continue to be below the laboratory reporting limits (<0.48 µg/L). This data indicates that complete dechlorination is not occurring at this time.

## **Geochemical Indicator MNA Parameter Summary**

The qualitative assessment of geochemical indicators during the five-year RA-O period in the shallow groundwater zone at LHAAP-67 indicates current geochemical conditions are not



favorable for MNA processes via biological reduction. Nonetheless, certain parameters observed in a few locations may indicate that conditions could favor biological natural attenuation, such as the low DO concentrations observed. The presence of degradation products, 1,2-DCA and 1,1-DCE, suggest that limited biological degradation is occurring; however, the primary MNA processes reducing concentrations are abiotic.

### 3.3 Third Line of Evidence: Microbial Analysis

If the first two lines of evidence for MNA are deemed inadequate or inconclusive, and/or if the need for a contingency remedy is evaluated, data from field or microcosm studies will be necessary to establish the third line of evidence for MNA.

Dechlorinating bacteria, *Dehalococcoides sp.* (DHC), were analyzed at 67WW08 and 67WW13 in October 2018 during the Year 5 RA-O sampling event. The DHC levels in both wells were significantly lower than  $1.0 \times 10^7$ , which is associated with concentrations that may be required to expect treatment (Xiaoxia 2006). DHC analysis was not conducted in May 2019 based on the recommendation in the 2019 Five Year Review (U.S. Army 2019) and will not be conducted in the future.



## 4.0 SUMMARY AND CONCLUSIONS

### 4.1 Summary

The LUC for LHAAP-67 is groundwater restriction, which prohibits water well installation for any purpose other than environmental monitoring and testing; and residential groundwater use within the LUC boundary until the levels of COCs in groundwater and soil allow unrestricted use and unlimited exposure. The annual LUC compliance inspection for the Year 5 RA-O period was conducted on 14 Aug 2019. No change in land use or groundwater use has occurred at the site during the entire five years of RA-O monitoring. Overall, the plume is stable; however, COC concentration above cleanup goals at the downgradient well 67WW02 has warranted the installation of two monitoring wells, 67WW17 and 67WW18, as shown in **Figure 3-1**.

No non-compliance issues or concerns were identified during the annual inspection and site monitoring wells were in good condition.

VOC data and geochemical indicators were collected over the course of the monitoring period at LHAAP-67 to evaluate effectiveness of MNA as a site remedy. A tiered approach was used to evaluate the occurrence of natural attenuation in site groundwater. The first line of evidence evaluated reductions in COC concentrations and assessed the time to achieve the MCL. The second line of evidence evaluated geochemical indicators, and the third line of evidence evaluated microbial populations in the aquifer. The results of the tiered evaluation and the conclusions are summarized below.

An assessment of the first line of evidence included an evaluation of the groundwater flow and COC degradation trends. Based on RA-O groundwater level measurements, the groundwater flow direction at LHAAP-67 continues to be north/northwest and towards monitoring well 67WW02. The 3<sup>rd</sup> RA-O assessment suggested that a possible shift in the plume to the west due to increasing COC concentrations toward 67WW14, however COCs were not observed above MCLs during the Year 4 and Year 5 RA-O sampling events and did not support this shift.

In-plume well 67WW15 (recently installed in May 2016) exhibited the highest levels of COCs during the Year 5 RA-O monitoring period for the third year in a row. 67WW01, cross-gradient well to 67WW15, also has some of the highest concentrations.

The only significantly decreasing trend was observed for 1,2-DCA, in the downgradient, south eastern monitoring well 67WW08. The first order rate constant for 1,2-DCA was estimated at 0.001 day<sup>-1</sup> and the time to achieve the MCL of 5 µg/L is estimated at 0.1 years. The decreasing

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trend may be the result of natural attenuation (e.g., dilution from clean upgradient groundwater).

Monitoring well 67WW01 was dry in October 2018, but an overall decrease was observed for both 1,1-DCE and 1,2-DCA between May 2018 and May 2019. At well 67WW02, even though there was an increase in 1,1-DCE concentration between October 2018 and May 2019, an overall decrease was observed between May 2018 and May 2019. At this well, a slight increase in 1,2-DCA concentration was observed from nondetect in October 2018 to 4.7 µg/L in May 2019. At 67WW13, significant increases were observed in 1,1-DCE and 1,2-DCA concentrations between May 2018 and October 2018, but concentration decreased again in May 2019. Both wells are located downgradient of monitoring well 67WW08, where concentrations are decreasing, and the increases may be due to the migration of these COCs in groundwater. Additionally, increases in 1,1-DCE and 1,2-DCA may be due to the degradation of 1,1,1-TCA and 1,1,2-TCA observed at LHAAP-67 since 1998.

At 67WW02 COC concentrations have increased above the MCL, and two downgradient monitoring wells outside the MCL boundary have been installed in July/August 2019 to aid in bounding the plume and assessing plume migration as recommended in the Fourth Five Year Review Report.

The qualitative assessment of geochemical indicators performed as the second line of evidence at LHAAP-67 indicates current geochemical conditions are not optimal for biological degradation MNA processes. Although, degradation products (1,2-DCA and 1,1-DCE) have been detected in monitoring wells, groundwater conditions within the impacted area are not favorable for complete biological reductive dechlorination of site COCs.

The third line of evidence to assess MNA is to evaluate microorganisms that demonstrate biological degradation. During the Year 5 RA-O, DHC was not observed at levels favorable for reductive dechlorination. DHC analysis was not conducted in May 2019 based on the recommendation in the 2019 Five Year Review (U.S. Army 2019) and will not be conducted in the future.

The evaluation of MNA at LHAAP-67 indicates that decreasing concentrations are primarily due to abiotic processes, including dispersion, dilution, sorption, and volatilization. After completion of the 5-year RA-O monitoring period, groundwater monitoring on an annual basis will continue to be performed at LHAAP-67 until the next Five Year Review, in compliance with the RAWP (AECOM 2013). Two new wells, 67WW17 and 67WW18, will be added to the next RA-O sampling event.

## 5.0 REFERENCES

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## Tables

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**Table 2-1**  
**Groundwater RA-O Sampling – 2018 and 2019**

| Monitoring Well ID  | October 2018                               |                               |                             |              | May 2019                                   |                               |                             |              |
|---------------------|--|-------------------------------|-----------------------------|--------------|--|-------------------------------|-----------------------------|--------------|
|                     | VOCs                                       | Field Parameters <sup>a</sup> | MNA Parameters <sup>b</sup> | Water Levels | VOCs                                       | Field Parameters <sup>a</sup> | MNA Parameters <sup>b</sup> | Water Levels |
| 67WW01              | Not a sufficient amount of water to sample |                               |                             | X            | X  | X                             |                             | X            |
| 67WW02              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW03              | Not a sufficient amount of water to sample |                               |                             | X            | Not a sufficient amount of water to sample |                               |                             | Dry          |
| 67WW04 <sup>c</sup> | Gauge for water levels only                |                               |                             | X            | Gauge for water levels only                |                               |                             | Dry          |
| 67WW05              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW06 <sup>d</sup> | Gauge for water levels only                |                               |                             | X            | Gauge for water levels only                |                               |                             | X            |
| 67WW07              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW08              | X  | X                             | X                           | X            | X  | X                             | X                           | X            |
| 67WW09              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW09A             | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW10              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW11              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW12              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW13              | X  | X                             | X                           | X            | X  | X                             | X                           | X            |
| 67WW14              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW15              | X  | X                             |                             | X            | X  | X                             |                             | X            |
| 67WW16I             | X  | X                             |                             | X            | X  | X                             |                             | X            |

Notes:

<sup>a</sup> Field parameters to be monitored for all wells: pH, temperature, conductivity, turbidity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and ferrous iron.

<sup>b</sup> MNA parameters include alkalinity, sulfate, sulfide, chloride, TOC, dissolved iron and manganese, total phosphorus, carbon dioxide, dissolved gases (methane, ethane, ethene) and total iron.

<sup>c</sup> 67WW04 was replaced by 67WW09A and 67WW10

<sup>d</sup> 67WW06 was eliminated in May 2018 due to the close proximity of 67WW07

ID - identification

MNA - monitored natural attenuation

RA-O - remedial action operation

TOC - total organic carbon

VOCs - volatile organic compounds

X - well will be analyzed for that parameter

**Table 2-2**  
**Groundwater Elevation Data, LHAAP-67**

| Well ID               | Sampling Date | Top of Casing Elevation | Ground Surface Elevation (ft MSL) | Depth to Water (ft from TOC) | Screen Interval (ft from TOC) |        | Screen Interval (ft MSL) |        | Groundwater Elevation (ft MSL) |
|-----------------------|---------------|-------------------------|-----------------------------------|------------------------------|-------------------------------|--------|--------------------------|--------|--------------------------------|
|                       |               |                         |                                   |                              | Top                           | Bottom | Top                      | Bottom |                                |
| 67WW01 <sup>c,d</sup> | 05/31/13      | 200.92                  | 198.21                            | 25.55                        | 17.25                         | 26.98  | 183.67                   | 173.94 | 175.37                         |
|                       | 09/27/13      | 200.92                  | 198.21                            | Dry                          | 17.25                         | 26.98  | 183.67                   | 173.94 | Dry                            |
|                       | 01/23/14      | 200.92                  | 198.21                            | Dry                          | 17.25                         | 26.98  | 183.67                   | 173.94 | Dry                            |
|                       | 05/07/14      | 200.92                  | 198.21                            | 26.9                         | 17.25                         | 26.98  | 183.67                   | 173.94 | 174.02                         |
|                       | 07/24/14      | 200.92                  | 198.21                            | 26.20                        | 17.25                         | 26.98  | 183.67                   | 173.94 | 174.72                         |
|                       | 12/02/14      | 200.92                  | 198.21                            | 25.17                        | 17.25                         | 26.98  | 183.67                   | 173.94 | 175.75                         |
|                       | 02/10/15      | 200.92                  | 198.21                            | 25.55                        | 17.25                         | 26.98  | 183.67                   | 173.94 | 175.37                         |
|                       | 05/19/15      | 200.92                  | 198.21                            | 23.40                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 177.52                         |
|                       | 11/18/15      | 200.92                  | 198.21                            | 26.17                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 174.75                         |
|                       | 03/28/16      | 200.92                  | 198.21                            | 23.71                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 177.21                         |
|                       | 05/18/16      | 200.92                  | 198.21                            | 23.26                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 177.66                         |
|                       | 11/28/17      | 200.92                  | 198.21                            | 25.95                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 174.97                         |
|                       | 05/02/18      | 200.92                  | 198.21                            | 24                           | 17.25                         | 26.98  | 183.64                   | 173.91 | 176.92                         |
|                       | 10/25/18      | 200.92                  | 198.21                            | 26.98                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 173.94                         |
|                       | 05/03/19      | 200.92                  | 198.21                            | 22.97                        | 17.25                         | 26.98  | 183.64                   | 173.91 | 177.95                         |
| 67WW02 <sup>c,d</sup> | 05/31/13      | 199.69                  | 196.61                            | 24.38                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 175.31                         |
|                       | 09/27/13      | 199.69                  | 196.61                            | 25.28                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 174.41                         |
|                       | 01/23/14      | 199.69                  | 196.61                            | 24.77                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 174.92                         |
|                       | 05/06/14      | 199.69                  | 196.61                            | 27.68                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 172.01                         |
|                       | 07/23/14      | 199.69                  | 196.61                            | 23.45                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 176.24                         |
|                       | 12/02/14      | 199.69                  | 196.61                            | 24.13                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 175.56                         |
|                       | 02/10/15      | 199.69                  | 196.61                            | 23.65                        | 18.05                         | 27.78  | 181.64                   | 171.91 | 176.04                         |
|                       | 05/11/15      | 199.69                  | 196.61                            | 22.79                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 176.90                         |
|                       | 11/18/15      | 199.69                  | 196.61                            | 24.22                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 175.47                         |
|                       | 05/18/16      | 199.69                  | 196.61                            | 22.58                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 177.11                         |
|                       | 11/28/17      | 199.69                  | 196.61                            | 23.95                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 175.74                         |
|                       | 05/03/18      | 199.69                  | 196.61                            | 24.15                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 175.54                         |
|                       | 10/25/18      | 199.69                  | 196.61                            | 24.35                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 175.34                         |
|                       | 05/01/19      | 199.69                  | 196.61                            | 22.42                        | 18.05                         | 27.78  | 181.97                   | 172.24 | 177.27                         |
| 67WW03 <sup>c</sup>   | 05/31/13      | 200.44                  | 198.12                            | 25.39                        | 15.27                         | 24.9   | 185.17                   | 175.54 | 175.05                         |
|                       | 09/27/13      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 01/23/14      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 05/06/14      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 07/23/14      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 12/02/14      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 02/10/15      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 05/11/15      | 200.44                  | 198.12                            | 22.98                        | 15.27                         | 24.9   | 185.17                   | 175.54 | 177.46                         |
|                       | 11/18/15      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 03/28/16      | 200.44                  | 198.12                            | 23.2                         | 15.27                         | 24.9   | 185.17                   | 175.54 | 177.24                         |
|                       | 05/18/16      | 200.44                  | 198.12                            | 22.76                        | 15.27                         | 24.9   | 185.17                   | 175.54 | 177.68                         |
|                       | 11/27/17      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 05/02/18      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |
|                       | 10/22/18      | 200.44                  | 198.12                            | 24.95                        | 15.27                         | 24.9   | 185.17                   | 175.54 | 175.49                         |
|                       | 05/02/19      | 200.44                  | 198.12                            | Dry                          | 15.27                         | 24.9   | 185.17                   | 175.54 | Dry                            |

**Table 2-2**  
**Groundwater Elevation Data, LHAAP-67**

| Well ID             | Sampling Date | Top of Casing Elevation | Ground Surface Elevation (ft MSL) | Depth to Water (ft from TOC) | Screen Interval (ft from TOC) |        | Screen Interval (ft MSL) |        | Groundwater Elevation (ft MSL) |
|---------------------|---------------|-------------------------|-----------------------------------|------------------------------|-------------------------------|--------|--------------------------|--------|--------------------------------|
|                     |               |                         |                                   |                              | Top                           | Bottom | Top                      | Bottom |                                |
| 67WW04 <sup>a</sup> | 09/27/13      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 01/23/14      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 05/06/14      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 07/25/14      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 12/02/14      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 02/10/15      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 05/11/15      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 11/18/15      | 203.76                  | 200.5                             | Dry                          | 3.26                          | 3.26   | 200.5                    | 200.5  | Dry                            |
|                     | 05/16/16      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 11/27/17      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 05/02/18      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
|                     | 10/25/18      | 203.76                  | 200.5                             | 24.48                        | 14.26                         | 24.26  | 189.5                    | 179.5  | 179.28                         |
|                     | 05/02/19      | 203.76                  | 200.5                             | Dry                          | 14.26                         | 24.26  | 189.5                    | 179.5  | Dry                            |
| 67WW05 <sup>a</sup> | 09/28/13      | 201                     | 197.48                            | 26.40                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 174.60                         |
|                     | 01/23/14      | 201                     | 197.48                            | 26.00                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.00                         |
|                     | 05/06/14      | 201                     | 197.48                            | 25.85                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.15                         |
|                     | 07/23/14      | 201                     | 197.48                            | 25.20                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.80                         |
|                     | 12/02/14      | 201                     | 197.48                            | 25.55                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.45                         |
|                     | 02/10/15      | 201                     | 197.48                            | 26.20                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 174.80                         |
|                     | 05/11/15      | 201                     | 197.48                            | 24.68                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 176.32                         |
|                     | 11/18/15      | 201                     | 197.48                            | 25.76                        | 3.52                          | 3.52   | 197.48                   | 197.48 | 175.24                         |
|                     | 05/18/16      | 201                     | 197.48                            | 24.56                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 176.44                         |
|                     | 11/28/17      | 201                     | 197.48                            | 25.6                         | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.40                         |
|                     | 05/02/18      | 201                     | 197.48                            | 25.8                         | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.20                         |
|                     | 10/25/18      | 201                     | 197.48                            | 25.8                         | 19.52                         | 29.52  | 181.48                   | 171.48 | 175.20                         |
|                     | 05/02/19      | 201                     | 197.48                            | 24.46                        | 19.52                         | 29.52  | 181.48                   | 171.48 | 176.54                         |
| 67WW06 <sup>a</sup> | 05/31/13      | 200.81                  | 196.95                            | 25.32                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 175.49                         |
|                     | 09/28/13      | 200.81                  | 196.95                            | 26.32                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 174.49                         |
|                     | 01/24/14      | 200.81                  | 196.95                            | 26.61                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 174.20                         |
|                     | 05/06/14      | 200.81                  | 196.95                            | 23.75                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 177.06                         |
|                     | 07/23/14      | 200.81                  | 196.95                            | 23.75                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 177.06                         |
|                     | 12/02/14      | 200.81                  | 196.95                            | 24.80                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 176.01                         |
|                     | 02/10/15      | 200.81                  | 196.95                            | 23.95                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 176.86                         |
|                     | 05/11/15      | 200.81                  | 196.95                            | 22.38                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 178.43                         |
|                     | 11/18/15      | 200.81                  | 196.95                            | 24.80                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 176.01                         |
|                     | 05/18/16      | 200.81                  | 196.95                            | 22.16                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 178.65                         |
|                     | 11/29/17      | 200.81                  | 196.95                            | 24.66                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 176.15                         |
|                     | 05/02/18      | 200.81                  | 196.95                            | 23.18                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 177.63                         |
|                     | 10/25/18      | 200.81                  | 196.95                            | 24.91                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 175.90                         |
|                     | 05/03/19      | 200.81                  | 196.95                            | 21.63                        | 41.86                         | 51.86  | 158.95                   | 148.95 | 179.18                         |
| 67WW07 <sup>a</sup> | 05/31/13      | 200.84                  | 197.04                            | 25.35                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 175.49                         |
|                     | 09/27/13      | 200.84                  | 197.04                            | 26.32                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 174.52                         |
|                     | 01/23/14      | 200.84                  | 197.04                            | 25.6                         | 17.8                          | 27.8   | 183.04                   | 173.04 | 175.24                         |
|                     | 05/06/14      | 200.84                  | 197.04                            | 23.8                         | 17.8                          | 27.8   | 183.04                   | 173.04 | 177.04                         |
|                     | 07/24/14      | 200.84                  | 197.04                            | 23.83                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 177.01                         |
|                     | 12/02/14      | 200.84                  | 197.04                            | 24.75                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 176.09                         |
|                     | 02/10/15      | 200.84                  | 197.04                            | 24.00                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 176.84                         |



**Table 2-2**  
**Groundwater Elevation Data, LHAAP-67**

| Well ID               | Sampling Date | Top of Casing Elevation | Ground Surface Elevation (ft MSL) | Depth to Water (ft from TOC) | Screen Interval (ft from TOC) |        | Screen Interval (ft MSL) |        | Groundwater Elevation (ft MSL) |
|-----------------------|---------------|-------------------------|-----------------------------------|------------------------------|-------------------------------|--------|--------------------------|--------|--------------------------------|
|                       |               |                         |                                   |                              | Top                           | Bottom | Top                      | Bottom |                                |
| 67WW07 <sup>a</sup>   | 05/11/15      | 200.84                  | 197.04                            | 22.45                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 178.39                         |
|                       | 11/18/15      | 200.84                  | 197.04                            | 24.84                        | 3.8                           | 3.8    | 197.04                   | 197.04 | 176.00                         |
|                       | 05/18/16      | 200.84                  | 197.04                            | 22.21                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 178.63                         |
|                       | 11/29/17      | 200.84                  | 197.04                            | 24.65                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 176.19                         |
|                       | 05/02/18      | 200.84                  | 197.04                            | 24.25                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 176.59                         |
|                       | 10/25/18      | 200.84                  | 197.04                            | 24.94                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 175.90                         |
|                       | 05/03/19      | 200.84                  | 197.04                            | 21.72                        | 17.8                          | 27.8   | 183.04                   | 173.04 | 179.12                         |
| 67WW08 <sup>b,d</sup> | 06/03/13      | 200.02                  | 197.60                            | 24.65                        | 26.02                         | 50.52  | 174                      | 149.5  | 175.37                         |
|                       | 10/02/13      | 200.02                  | 197.60                            | 25.57                        | 26.02                         | 50.52  | 174                      | 149.5  | 174.45                         |
|                       | 01/23/14      | 200.02                  | 197.60                            | 24.9                         | 26.02                         | 50.52  | 174                      | 149.5  | 175.12                         |
|                       | 05/07/14      | 200.02                  | 197.60                            | 23.65                        | 26.02                         | 50.52  | 174                      | 149.5  | 176.37                         |
|                       | 07/24/14      | 200.02                  | 197.60                            | 23.41                        | 26.02                         | 50.52  | 174                      | 149.5  | 176.61                         |
|                       | 12/04/14      | 200.02                  | 197.60                            | 24.23                        | 26.02                         | 50.52  | 174                      | 149.5  | 175.79                         |
|                       | 02/11/15      | 200.02                  | 197.60                            | 23.46                        | 26.02                         | 50.52  | 174                      | 149.5  | 176.56                         |
|                       | 05/19/15      | 200.02                  | 197.60                            | 22.25                        | 26.02                         | 50.52  | 174                      | 149.5  | 177.77                         |
|                       | 11/19/15      | 200.02                  | 197.60                            | 24.38                        | 2.42                          | 2.42   | 197.6                    | 197.6  | 175.64                         |
|                       | 05/19/16      | 200.02                  | 197.60                            | 22.12                        | 26.04                         | 50.54  | 174                      | 149.5  | 177.90                         |
|                       | 11/28/17      | 200.02                  | 197.60                            | 24                           | 26.04                         | 50.54  | 174                      | 149.5  | 176.02                         |
|                       | 05/01/18      | 200.02                  | 197.60                            | 22.92                        | 26.04                         | 50.54  | 174                      | 149.5  | 177.10                         |
|                       | 10/23/18      | 200.02                  | 197.60                            | 24.41                        | 26.04                         | 50.54  | 174                      | 149.5  | 175.61                         |
|                       | 05/01/19      | 200.02                  | 197.60                            | 21.67                        | 26.04                         | 50.54  | 174                      | 149.5  | 178.35                         |
| 67WW09 <sup>b</sup>   | 06/01/13      | 198.21                  | 195.72                            | 22.78                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 175.43                         |
|                       | 09/28/13      | 198.21                  | 195.72                            | 23.66                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 174.55                         |
|                       | 01/24/14      | 198.21                  | 195.72                            | 22.95                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 175.26                         |
|                       | 05/06/14      | 198.21                  | 195.72                            | 21.52                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 176.69                         |
|                       | 07/25/14      | 198.21                  | 195.72                            | 21.40                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 176.81                         |
|                       | 12/04/14      | 198.21                  | 195.72                            | 22.25                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 175.96                         |
|                       | 02/11/15      | 198.21                  | 195.72                            | 21.50                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 176.71                         |
|                       | 05/19/15      | 198.21                  | 195.72                            | 20.30                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 177.91                         |
|                       | 11/18/15      | 198.21                  | 195.72                            | 22.24                        | 2.49                          | 2.49   | 195.72                   | 195.72 | 175.97                         |
|                       | 05/18/16      | 198.21                  | 195.72                            | 20.15                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 178.06                         |
|                       | 11/27/17      | 198.21                  | 195.72                            | 22.06                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 176.15                         |
|                       | 05/02/18      | 198.21                  | 195.72                            | 20.95                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 177.26                         |
|                       | 10/23/18      | 198.21                  | 195.72                            | 22.43                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 175.78                         |
|                       | 05/03/19      | 198.21                  | 195.72                            | 19.83                        | 16.99                         | 36.49  | 181.22                   | 161.72 | 178.38                         |
| 67WW09A <sup>b</sup>  | 09/27/13      | 202.93                  | 200.4                             | 28.4                         | 23.33                         | 38.03  | 179.6                    | 164.9  | 174.53                         |
|                       | 01/23/14      | 202.93                  | 200.4                             | 27.65                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 175.28                         |
|                       | 05/06/14      | 202.93                  | 200.4                             | 26.1                         | 23.33                         | 38.03  | 179.6                    | 164.9  | 176.83                         |
|                       | 07/24/14      | 202.93                  | 200.4                             | 26.06                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 176.87                         |
|                       | 12/03/14      | 202.93                  | 200.4                             | 27.00                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 175.93                         |
|                       | 02/10/15      | 202.93                  | 200.4                             | 26.11                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 176.82                         |
|                       | 05/12/15      | 202.93                  | 200.4                             | 24.97                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 177.96                         |
|                       | 11/18/15      | 202.93                  | 200.4                             | 26.97                        | 2.53                          | 2.53   | 200.4                    | 200.4  | 175.96                         |
|                       | 05/18/16      | 202.93                  | 200.4                             | 24.61                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 178.32                         |
|                       | 11/29/17      | 202.93                  | 200.4                             | 26.81                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 176.12                         |
|                       | 05/03/18      | 202.93                  | 200.4                             | 25.78                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 177.15                         |
|                       | 10/25/18      | 202.93                  | 200.4                             | 27.02                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 175.91                         |
|                       | 05/02/19      | 202.93                  | 200.4                             | 24.35                        | 23.33                         | 38.03  | 179.6                    | 164.9  | 178.58                         |

**Table 2-2**  
**Groundwater Elevation Data, LHAAP-67**

| Well ID             | Sampling Date | Top of Casing Elevation | Ground Surface Elevation (ft MSL) | Depth to Water (ft from TOC) | Screen Interval (ft from TOC) |        | Screen Interval (ft MSL) |        | Groundwater Elevation (ft MSL) |
|---------------------|---------------|-------------------------|-----------------------------------|------------------------------|-------------------------------|--------|--------------------------|--------|--------------------------------|
|                     |               |                         |                                   |                              | Top                           | Bottom | Top                      | Bottom |                                |
| 67WW10 <sup>b</sup> | 06/01/13      | 201.51                  | 198.8                             | 26.1                         | 22.71                         | 52.21  | 178.8                    | 149.3  | 175.41                         |
|                     | 09/27/13      | 201.51                  | 198.8                             | 27.03                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 174.48                         |
|                     | 01/24/14      | 201.51                  | 198.8                             | 26.22                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 175.29                         |
|                     | 05/06/14      | 201.51                  | 198.8                             | 24.4                         | 22.71                         | 52.21  | 178.8                    | 149.3  | 177.11                         |
|                     | 07/24/14      | 201.51                  | 198.8                             | 24.42                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 177.09                         |
|                     | 12/03/14      | 201.51                  | 198.8                             | 25.58                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 175.93                         |
|                     | 02/10/15      | 201.51                  | 198.8                             | 24.55                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 176.96                         |
|                     | 05/12/15      | 201.51                  | 198.8                             | 23.10                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 178.41                         |
|                     | 11/18/15      | 201.51                  | 198.8                             | 25.49                        | 2.71                          | 2.71   | 198.8                    | 198.8  | 176.02                         |
|                     | 05/18/16      | 201.51                  | 198.8                             | 22.73                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 178.78                         |
|                     | 11/29/17      | 201.51                  | 198.8                             | 25.35                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 176.16                         |
|                     | 05/03/18      | 201.51                  | 198.8                             | 23.77                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 177.74                         |
|                     | 10/22/18      | 201.51                  | 198.8                             | 25.65                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 175.86                         |
|                     | 05/02/19      | 201.51                  | 198.8                             | 22.31                        | 22.71                         | 52.21  | 178.8                    | 149.3  | 179.20                         |
| 67WW11 <sup>b</sup> | 06/01/13      | 199.64                  | 197.21                            | 24.21                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.43                         |
|                     | 10/02/13      | 199.64                  | 197.21                            | 25.17                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 174.47                         |
|                     | 01/23/14      | 199.64                  | 197.21                            | 24.45                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.19                         |
|                     | 05/06/14      | 199.64                  | 197.21                            | 22.86                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 176.78                         |
|                     | 07/24/14      | 199.64                  | 197.21                            | 23.89                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.75                         |
|                     | 12/04/14      | 199.64                  | 197.21                            | 23.77                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.87                         |
|                     | 02/11/15      | 199.64                  | 197.21                            | 23.95                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.69                         |
|                     | 05/19/15      | 199.64                  | 197.21                            | 21.67                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 177.97                         |
|                     | 11/19/15      | 199.64                  | 197.21                            | 23.91                        | 2.43                          | 2.43   | 197.21                   | 197.21 | 175.73                         |
|                     | 05/19/16      | 199.64                  | 197.21                            | 22.48                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 177.16                         |
|                     | 11/27/17      | 199.64                  | 197.21                            | 23.53                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 176.11                         |
|                     | 05/02/18      | 199.64                  | 197.21                            | 22.37                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 177.27                         |
|                     | 10/23/18      | 199.64                  | 197.21                            | 23.95                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 175.69                         |
|                     | 05/01/19      | 199.64                  | 197.21                            | 21.21                        | 22.93                         | 47.43  | 176.71                   | 152.21 | 178.43                         |
| 67WW12 <sup>b</sup> | 06/01/13      | 201.65                  | 199.07                            | 26.46                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 175.19                         |
|                     | 10/01/13      | 201.65                  | 199.07                            | 24.4                         | 26.58                         | 36.08  | 175.07                   | 165.57 | 177.25                         |
|                     | 01/24/14      | 201.65                  | 199.07                            | 26.8                         | 26.58                         | 36.08  | 175.07                   | 165.57 | 174.85                         |
|                     | 05/06/14      | 201.65                  | 199.07                            | 25.43                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 176.22                         |
|                     | 07/25/14      | 201.65                  | 199.07                            | 25.30                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 176.35                         |
|                     | 12/03/14      | 201.65                  | 199.07                            | 26.12                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 175.53                         |
|                     | 02/10/15      | 201.65                  | 199.07                            | 25.35                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 176.30                         |
|                     | 05/12/15      | 201.65                  | 199.07                            | 24.50                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 177.15                         |
|                     | 11/18/15      | 201.65                  | 199.07                            | 26.16                        | 2.58                          | 2.58   | 199.07                   | 199.07 | 175.49                         |
|                     | 05/18/16      | 201.65                  | 199.07                            | 24.16                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 177.49                         |
|                     | 11/29/17      | 201.65                  | 199.07                            | 26.03                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 175.62                         |
|                     | 05/03/18      | 201.65                  | 199.07                            | 24.85                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 176.80                         |
|                     | 10/22/18      | 201.65                  | 199.07                            | 26.30                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 175.35                         |
|                     | 05/02/19      | 201.65                  | 199.07                            | 23.85                        | 26.58                         | 36.08  | 175.07                   | 165.57 | 177.80                         |
| 67WW13              | 05/31/13      | 197.92                  | 195.85                            | 22.55                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 175.37                         |
|                     | 10/01/13      | 197.92                  | 195.85                            | 23.42                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 174.50                         |
|                     | 01/24/14      | 197.92                  | 195.85                            | 22.68                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 175.24                         |
|                     | 05/06/14      | 197.92                  | 195.85                            | 21.66                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 176.26                         |
|                     | 07/25/14      | 197.92                  | 195.85                            | 21.55                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 176.37                         |
|                     | 12/04/14      | 197.92                  | 195.85                            | 22.22                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 175.70                         |

**Table 2-2**  
**Groundwater Elevation Data, LHAAP-67**

| Well ID             | Sampling Date | Top of Casing Elevation | Ground Surface Elevation (ft MSL) | Depth to Water (ft from TOC) | Screen Interval (ft from TOC) |        | Screen Interval (ft MSL) |        | Groundwater Elevation (ft MSL) |
|---------------------|---------------|-------------------------|-----------------------------------|------------------------------|-------------------------------|--------|--------------------------|--------|--------------------------------|
|                     |               |                         |                                   |                              | Top                           | Bottom | Top                      | Bottom |                                |
| 67WW13              | 02/11/15      | 197.92                  | 195.85                            | 21.61                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 176.31                         |
|                     | 05/19/15      | 197.92                  | 195.85                            | 20.55                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 177.37                         |
|                     | 11/18/15      | 197.92                  | 195.85                            | 22.22                        | 2.07                          | 2.07   | 195.85                   | 195.85 | 175.70                         |
|                     | 05/19/16      | 197.92                  | 195.85                            | 20.40                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 177.52                         |
|                     | 11/28/17      | 197.92                  | 195.85                            | 21.98                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 175.94                         |
|                     | 05/01/18      | 197.92                  | 195.85                            | 21.1                         | 12.57                         | 27.07  | 185.35                   | 170.85 | 176.82                         |
|                     | 10/23/18      | 197.92                  | 195.85                            | 22.38                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 175.54                         |
| 67WW14              | 05/01/19      | 197.92                  | 195.85                            | 20.18                        | 12.57                         | 27.07  | 185.35                   | 170.85 | 177.74                         |
|                     | 10/01/13      | 196.96                  | 194.52                            | 21.8                         | 14.44                         | 29.44  | 182.52                   | 167.52 | 175.16                         |
|                     | 01/24/14      | 196.96                  | 194.52                            | 21.47                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 175.49                         |
|                     | 05/07/14      | 196.96                  | 194.52                            | 20.58                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.38                         |
|                     | 07/25/14      | 196.96                  | 194.52                            | 20.25                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.71                         |
|                     | 12/03/14      | 196.96                  | 194.52                            | 20.85                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.11                         |
|                     | 02/10/15      | 196.96                  | 194.52                            | 20.40                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.56                         |
|                     | 05/12/15      | 196.96                  | 194.52                            | 19.64                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 177.32                         |
|                     | 11/18/15      | 196.96                  | 194.52                            | 20.81                        | 2.44                          | 2.44   | 194.52                   | 194.52 | 176.15                         |
|                     | 05/18/16      | 196.96                  | 194.52                            | 19.4                         | 14.44                         | 29.44  | 182.52                   | 167.52 | 177.56                         |
|                     | 11/27/17      | 196.96                  | 194.52                            | 20.51                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.45                         |
|                     | 05/02/18      | 196.96                  | 194.52                            | 19.9                         | 14.44                         | 29.44  | 182.52                   | 167.52 | 177.06                         |
| 67WW15              | 10/22/18      | 196.96                  | 194.52                            | 20.85                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 176.11                         |
|                     | 05/02/19      | 196.96                  | 194.52                            | 18.78                        | 14.44                         | 29.44  | 182.52                   | 167.52 | 178.18                         |
|                     | 05/19/16      | 199.82                  | 197.24                            | 22.18                        | 34.20                         | 43.90  | 165.62                   | 155.92 | 177.64                         |
|                     | 11/27/17      | 199.82                  | 197.24                            | 23.85                        | 34.20                         | 43.90  | 165.62                   | 155.92 | 175.97                         |
|                     | 05/02/18      | 199.82                  | 197.24                            | 23                           | 34.20                         | 43.90  | 165.62                   | 155.92 | 176.82                         |
| 67WW16 <sup>e</sup> | 10/23/18      | 199.82                  | 197.24                            | 24.23                        | 34.20                         | 43.90  | 165.62                   | 155.92 | 175.59                         |
|                     | 05/03/19      | 199.82                  | 197.24                            | 22.04                        | 34.20                         | 43.90  | 165.62                   | 155.92 | 177.78                         |
|                     | 05/18/16      | 199.51                  | 197.12                            | 21.95                        | 67.70                         | 77.40  | 131.81                   | 122.11 | 177.56                         |
|                     | 11/29/17      | 199.51                  | 197.12                            | 24.81                        | 67.70                         | 77.40  | 131.81                   | 122.11 | 174.70                         |
|                     | 05/03/18      | 199.51                  | 197.12                            | 22.75                        | 67.70                         | 77.40  | 131.81                   | 122.11 | 176.76                         |
|                     | 10/25/18      | 199.51                  | 197.12                            | 24.03                        | 67.70                         | 77.40  | 131.81                   | 122.11 | 175.48                         |
|                     | 05/01/19      | 199.51                  | 197.12                            | 21.8                         | 67.70                         | 77.40  | 131.81                   | 122.11 | 177.71                         |

Notes:

Elevations are reported as feet above mean sea level (ft MSL).

<sup>a</sup> Screen information calculated from Data Gap Investigation Report (Shaw 2007).

<sup>b</sup> Screen information calculated from well construction detail forms.

<sup>c</sup> Well screen top and bottom depths and elevations for monitoring wells 67WW01, 67WW02, and 67WW03 were revised/confirmed with a downhole camera survey performed in March 2015.

<sup>d</sup> Monitoring wells 67WW01, 67WW02, and 67WW08 were re-surveyed in September 2016 and elevations in the table for these wells are based on the re-survey results.

<sup>e</sup> Intermediate zone monitoring well

Dry - insufficient or no water in well

ft - feet

ID - identification

MSL - mean sea level

TOC - top of casing

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |        |                 | 67WW01     | 67WW01        |               | 67WW02 |               |        |            | 67WW03   |               | 67WW05         |          |               |               |               |               | 67WW07        |               |                |            | 67WW08        |          |              |          |  |      |  |
|--|--------|-----------------|------------|---------------|---------------|--------|---------------|--------|------------|----------|---------------|----------------|----------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|------------|---------------|----------|--------------|----------|--|------|--|
|  |        |                 |            | 67WW01-190503 | 67WW02-181025 |        | 67WW02-190501 |        |            |          | 67WW05-181025 | 67WW05-181025- |          | 67WW05-190502 | 67WW07-181025 |               | 67WW07-190503 |               | 67WW08-181023 | 67WW08-181023- |            | 67WW08-190501 |          |              |          |  |      |  |
|  |        |                 | 10/25/2019 | 5/3/2019      | 10/25/2018    |        | 5/1/2019      |        | 10/22/2019 | 5/2/2019 | 10/25/2018    | 10/25/2018     |          | 5/2/2019      | 10/25/2018    |               | 5/3/2019      |               | 10/23/2018    |                | 10/23/2018 |               | 5/1/2019 |              |          |  |      |  |
|  |        |                 |            | 22.97 - 23.23 | 24.35 - 24.6  |        | 22.42 - 22.67 |        |            |          | 25.8 - 26.07  | 25.8 - 26.07   |          | 24.46 - 24.68 |               | 24.94 - 25.19 |               | 21.72 - 21.95 |               | 24.41 - 24.62  |            | 24.41 - 24.62 |          | 21.67 - 21.9 |          |  |      |  |
| Sample Purpose   |        |                 | REG        |               | REG           |        | REG           |        |            |          |               |                | REG      |               | FD            |               | REG           |               | REG           |                | REG        |               | REG      |              | REG      |  |      |  |
| Parameter  | Units  | MCL /<br>GW-Ind |            | Result        | Val Qual      | Result | Val Qual      | Result | Val Qual   |          |               | Result         | Val Qual | Result        | Val Qual      | Result        | Val Qual      | Result        | Val Qual      | Result         | Val Qual   | Result        | Val Qual | Result       | Val Qual |  |      |  |
| ANIONS   |        |                 | Dry        |               |               |        |               |        |            | Dry      | Dry           |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Chloride   | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Nitrate  | mg/L   | 10              |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Nitrogen, Nitrite (As N)   | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Sulfate  | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Sulfide  | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| DHC  |        |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Dehalococcoides  | CEQ/mL |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| FIELD TESTS  |        |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Conductivity   | µS/cm  |                 |            |               | 3.67          |        | 4.0           |        | 4.03       |          |               |                |          |               | 2.75          |               |               | 2.65          |               | 3.80           |            | 3.70          |          | 6.29         |          |  | 6.28 |  |
| Dissolved oxygen   | mg/L   |                 |            | 0.46          |               | 1.27   |               | 0.27   |            |          |               | 0.11           |          |               | 1.99          |               | 0.1           |               | 0.07          |                | 0.08       |               |          | 0.08         |          |  |      |  |
| Oxidation-reduction potential  | mV     |                 |            | 202           |               | 129    |               | 73     |            |          |               | 172            |          |               | 247           |               | 200           |               | 249           |                | 150        |               |          | 138          |          |  |      |  |
| pH   | SU     |                 |            | 6.17          |               | 6.50   |               | 5.74   |            |          |               | 5.17           |          |               | 4.11          |               | 5.01          |               | 5.05          |                | 6.33       |               |          | 5.82         |          |  |      |  |
| Temperature  | C      |                 |            | 19.81         |               | 19.04  |               | 24     |            |          |               | 17.93          |          |               | 20.1          |               | 17.79         |               | 20.26         |                | 18.14      |               |          | 20.44        |          |  |      |  |
| Turbidity  | NTU    |                 |            | 100           |               | 1.1    |               | 0      |            |          |               | 21.3           |          |               | 55.2          |               | 65.6          |               | 31.4          |                | 0          |               |          | 0            |          |  |      |  |
| GASES  |        |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Carbon dioxide   | µg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Ethane   | µg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Ethylene   | µg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Methane  | µg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| GEN CHEMISTRY  |        |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Alkalinity   | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Total inorganic carbon   | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| Total organic carbon   | mg/L   |                 |            |               |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |
| METALS   |        |                 |            | </            |               |        |               |        |            |          |               |                |          |               |               |               |               |               |               |                |            |               |          |              |          |  |      |  |

Table 2-3  
Groundwater Results 2018-2019

| Location Code             |       |                 | 67WW01     | 67WW01        |          | 67WW02        |          |               |          | 67WW03     |          | 67WW05        |          |                |          | 67WW07        |          |               |          | 67WW08        |          |               |          |                |          |               |          |
|---------------------------|-------|-----------------|------------|---------------|----------|---------------|----------|---------------|----------|------------|----------|---------------|----------|----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|---------------|----------|
| Sample ID                 |       |                 |            | 67WW01-190503 |          | 67WW02-181025 |          | 67WW02-190501 |          |            |          | 67WW05-181025 |          | 67WW05-181025- |          | 67WW05-190502 |          | 67WW07-181025 |          | 67WW07-190503 |          | 67WW08-181023 |          | 67WW08-181023- |          | 67WW08-190501 |          |
| Sample Date               |       |                 | 10/25/2019 | 5/3/2019      |          | 10/25/2018    |          | 5/1/2019      |          | 10/22/2019 | 5/2/2019 | 10/25/2018    |          | 10/25/2018     |          | 5/2/2019      |          | 10/25/2018    |          | 5/3/2019      |          | 10/23/2018    |          | 10/23/2018     |          | 5/1/2019      |          |
| Depth                     |       |                 |            | 22.97 - 23.23 |          | 24.35 - 24.6  |          | 22.42 - 22.67 |          |            |          | 25.8 - 26.07  |          | 25.8 - 26.07   |          | 24.46 - 24.68 |          | 24.94 - 25.19 |          | 21.72 - 21.95 |          | 24.41 - 24.62 |          | 24.41 - 24.62  |          | 21.67 - 21.9  |          |
| Sample Purpose            |       |                 |            | REG           |          | REG           |          | REG           |          |            |          | REG           |          | FD             |          | REG           |          | REG           |          | REG           |          | REG           |          | FD             |          | REG           |          |
| Parameter                 | Units | MCL /<br>GW-Ind |            | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |            |          | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual |
| Acetone                   | µg/L  | 92,000          |            | < 0.4         | U        | < 2           | U        | < 0.4         | U        |            |          | < 2           | U        | < 2            | U        | < 0.4         | U        | < 2           | U        | < 0.4         | U        | < 2           | U        | < 2            | U        | < 0.4         | U        |
| Benzene                   | µg/L  | 5               |            | < 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        | < 0.2         | U        |
| Bromobenzene              | µg/L  | 2,000           |            | < 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        | < 0.4          | U        | < 0.4         | U        |
| Bromochloromethane        | µg/L  | 4,100           |            | < 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        | < 0.2         | U        |
| Bromodichloromethane      | µg/L  | 4.6             |            | < 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        | < 0.2         | U        |
| Bromoform                 | µg/L  | 36              |            | < 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        | < 0.4          | U        | < 0.4         | U        |
| Bromomethane              | µg/L  | 140             |            | < 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        | < 0.4          | U        | < 0.4         | U        |
| Carbon disulfide          | µg/L  | 10,000          |            | < 0.6         | U        | < 0.6         | U        | < 0.6         | U        |            |          | < 0.6         | U        | < 0.6          | U        | < 0.6         | U        | < 0.6         | U        | < 0.6         | U        | < 0.6         | U        | < 0.6          | U        | < 0.6         | U        |
| Carbon tetrachloride      | µg/L  | 5               |            | < 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        | < 0.5          | U        | < 0.5         | U        |
| Chlorobenzene             | µg/L  | 100             |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Chloroethane              | µg/L  | 41,000          |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Chloroform                | µg/L  | 1,000           |            | < 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        | < 0.2         | U        |
| Chloromethane             | µg/L  | 220             |            | < 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        | < 0.2         | U        |
| cis-1,2-Dichloroethene    | µg/L  | 70              |            | 0.86          | J        | < 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        |
| cis-1,3-Dichloropropene   | µg/L  | 5.3             |            | < 0.1         | U        | < 0.1         | U        | < 0.1         | U        |            |          | < 0.1         | U        | < 0.1          | U        | < 0.1         | U        | < 0.1         | U        | < 0.1         | U        | < 0.1         | U        | < 0.1          | U        | < 0.1         | U        |
| Dibromochloromethane      | µg/L  | 34              |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Dibromomethane            | µg/L  | 380             |            | < 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        | < 0.2         | U        |
| Dichlorodifluoromethane   | µg/L  | 20,000          |            | < 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         | UJ       | < 0.3          | UJ       | < 0.3         | U        |
| Ethylbenzene              | µg/L  | 700             |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Hexachlorobutadiene       | µg/L  | 20              |            | < 1           | U        | < 1           | U        | < 1           | U        |            |          | < 1           | U        | < 1            | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1            | U        | < 1           | U        |
| Isopropylbenzene          | µg/L  | 10,000          |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| m,p-Xylenes               | µg/L  | 10,000          |            | < 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        | < 0.5          | U        | < 0.5         | U        |
| Methyl isobutyl ketone    | µg/L  | 8,200           |            | < 0.7         | U        | < 0.7         | U        | < 0.7         | U        |            |          | < 0.7         | U        | < 0.7          | U        | < 0.7         | U        | < 0.7         | U        | < 0.7         | U        | < 0.7         | U        | < 0.7          | U        | < 0.7         | U        |
| Methylene chloride        | µg/L  | 5               |            | < 0.4         | U        | < 1           | U        | < 0.4         | U        |            |          | < 1           | U        | < 1            | U        | < 0.4         | U        | < 1           | U        | < 0.4         | U        | < 1           | U        | < 1            | U        | < 0.4         | U        |
| Naphthalene               | µg/L  | 2,000           |            | < 0.3         | U        | < 0.3         | UJ       | < 0.3         | U        |            |          | < 0.3         | UJ       | < 0.3          | U        | < 0.3         | UJ       | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3         | U        |
| n-Butylbenzene            | µg/L  | 4,100           |            | < 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        | < 0.4          | U        | < 0.4         | U        |
| n-Propylbenzene           | µg/L  | 4,100           |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| o-Xylene                  | µg/L  | 10,000          |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| p-Isopropyltoluene        | µg/L  | 10,000          |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| sec-Butylbenzene          | µg/L  | 4,100           |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Styrene                   | µg/L  | 100             |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| tert-Butylbenzene         | µg/L  | 4,100           |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Tetrachloroethene         | µg/L  | 5               |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Toluene                   | µg/L  | 1,000           |            | < 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        | < 0.2         | U        |
| trans-1,2-Dichloroethene  | µg/L  | 100             |            | < 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        | < 0.2         | U        |
| trans-1,3-Dichloropropene | µg/L  | 29              |            | < 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        | < 0.2         | U        |
| Trichloroethene           | µg/L  | 5               |            | 1.3           |          | < 0.2         | U        | 0.87          | J        |            |          | < 0.2         | U        | < 0.2          | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2         | U        |
| Trichlorofluoromethane    | µg/L  | 31,000          |            | < 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        | < 0.3          | U        | < 0.3         | U        |
| Vinyl chloride            | µg/L  | 2               |            | 0.92          | J        | < 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        |

[illegible]

Table 2-3  
Groundwater Results 2018-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |       |                 | 67WW09        |               | 67WW09A        |                | 67WW10        |               | 67WW11        |               | 67WW12        |               | 67WW13        |               |                |          |       |   |       |    |       |   |       |    |       |   |       |   |
|--|-------|-----------------|---------------|---------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|----------|-------|---|-------|----|-------|---|-------|----|-------|---|-------|---|
|  |       |                 | 67WW09-181023 | 67WW09-190503 | 67WW09A-181025 | 67WW09A-190502 | 67WW10-181022 | 67WW10-190502 | 67WW11-181023 | 67WW11-190501 | 67WW12-181022 | 67WW12-190502 | 67WW13-181023 | 67WW13-190501 | 67WW13-190501- |          |       |   |       |    |       |   |       |    |       |   |       |   |
|  |       |                 | 10/23/2018    | 5/3/2019      | 10/25/2018     | 5/2/2019       | 10/22/2018    | 5/2/2019      | 10/23/2018    | 5/1/2019      | 10/22/2018    | 5/2/2019      | 10/23/2018    | 5/1/2019      | 5/1/2019       |          |       |   |       |    |       |   |       |    |       |   |       |   |
|  |       |                 | 22.43 - 22.65 | 19.83 - 20.06 | 27.02 - 27.26  | 24.35 - 24.58  | 25.65 - 25.88 | 22.31 - 22.53 | 23.95 - 24.2  | 21.21 - 21.44 | 26.3 - 26.55  | 23.85 - 24.05 | 22.38 - 22.62 | 20.18 - 20.4  | 20.18 - 20.4   |          |       |   |       |    |       |   |       |    |       |   |       |   |
|  |       |                 | REG           |               | REG            |                | REG           |               | REG           |               | REG           |               | REG           |               | FD             |          |       |   |       |    |       |   |       |    |       |   |       |   |
| Parameter  | Units | MCL /<br>GW-Ind | Result        | Val Qual      | Result         | Val Qual       | Result        | Val Qual      | Result        | Val Qual      | Result        | Val Qual      | Result        | Val Qual      | Result         | Val Qual |       |   |       |    |       |   |       |    |       |   |       |   |
| Acetone  | µg/L  | 92,000          | < 2           | U             | < 0.4          | U              | < 2           | U             | < 0.4         | U             | < 2           | U             | < 0.4         | U             | 5.6            | U        | < 2   | U | < 0.4 | U  | < 2   | U | < 0.4 | U  | < 0.4 | U | < 0.4 | U |
| Benzene  | µg/L  | 5               | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Bromobenzene   | µg/L  | 2,000           | < 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  | < 0.4 | U | < 0.4 | U  | < 0.4 | U | < 0.4 | U |
| Bromochloromethane   | µg/L  | 4,100           | < 0.2         | U             | < 0.2          | U              | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2          | UJ       | < 0.2 | U | < 0.2 | U  | < 0.2 | U | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Bromodichloromethane   | µg/L  | 4.6             | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Bromoform  | µg/L  | 36              | < 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  | < 0.4 | U | < 0.4 | U  | < 0.4 | U | < 0.4 | U |
| Bromomethane   | µg/L  | 140             | < 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  | < 0.4 | U | < 0.4 | U  | < 0.4 | U | < 0.4 | U |
| Carbon disulfide   | µg/L  | 10,000          | < 0.6         | U             | < 0.6          | U              | < 0.6         | U             | < 0.6         | U             | < 0.6         | U             | < 0.6         | U             | < 0.6          | U        | < 0.6 | U | < 0.6 | U  | < 0.6 | U | < 0.6 | U  | < 0.6 | U | < 0.6 | U |
| Carbon tetrachloride   | µg/L  | 5               | < 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  | < 0.5 | U | < 0.5 | U  | < 0.5 | U | < 0.5 | U |
| Chlorobenzene  | µg/L  | 100             | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Chloroethane   | µg/L  | 41,000          | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Chloroform   | µg/L  | 1,000           | < 0.2         | U             | < 0.2          | U              | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2          | UJ       | < 0.2 | U | < 0.2 | U  | 1.4   |   | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Chloromethane  | µg/L  | 220             | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| cis-1,2-Dichloroethene   | µg/L  | 70              | < 0.2         | U             | < 0.2          | U              | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2         | U             | < 0.2          | UJ       | < 0.2 | U | < 0.2 | U  | 1.9   |   | 0.94  | J  | 0.81  | J |       |   |
| cis-1,3-Dichloropropene  | µg/L  | 5.3             | < 0.1         | U             | < 0.1          | U              | < 0.1         | U             | < 0.1         | U             | < 0.1         | U             | < 0.1         | U             | < 0.1          | U        | < 0.1 | U | < 0.1 | U  | < 0.1 | U | < 0.1 | U  | < 0.1 | U | < 0.1 | U |
| Dibromochloromethane   | µg/L  | 34              | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Dibromomethane   | µg/L  | 380             | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Dichlorodifluoromethane  | µg/L  | 20,000          | < 0.3         | UJ            | < 0.3          | U              | < 0.3         | U             | < 0.3         | U             | < 0.3         | UJ            | < 0.3         | U             | < 0.3          | UJ       | < 0.3 | U | < 0.3 | UJ | < 0.3 | U | < 0.3 | UJ | < 0.3 | U | < 0.3 | U |
| Ethylbenzene   | µg/L  | 700             | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Hexachlorobutadiene  | µg/L  | 20              | < 1           | U             | < 1            | U              | < 1           | U             | < 1           | U             | < 1           | U             | < 1           | U             | < 1            | U        | < 1   | U | < 1   | U  | < 1   | U | < 1   | U  | < 1   | U | < 1   | U |
| Isopropylbenzene   | µg/L  | 10,000          | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| m,p-Xylenes  | µg/L  | 10,000          | < 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  | < 0.5 | U | < 0.5 | U  | < 0.5 | U | < 0.5 | U |
| Methyl isobutyl ketone   | µg/L  | 8,200           | < 0.7         | U             | < 0.7          | U              | < 0.7         | U             | < 0.7         | U             | < 0.7         | U             | < 0.7         | U             | < 0.7          | U        | < 0.7 | U | < 0.7 | U  | < 0.7 | U | < 0.7 | U  | < 0.7 | U | < 0.7 | U |
| Methylene chloride   | µg/L  | 5               | < 1           | U             | < 0.4          | U              | < 1           | U             | < 0.4         | U             | < 1           | U             | < 0.4         | U             | < 1            | U        | < 0.4 | U | < 1   | U  | < 0.4 | U | < 1   | U  | < 0.4 | U | < 0.4 | U |
| Naphthalene  | µg/L  | 2,000           | < 0.3         | U             | < 0.3          | U              | < 0.3         | UJ            | < 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 | < 0.3 | U |
| n-Butylbenzene   | µg/L  | 4,100           | < 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  | < 0.4 | U | < 0.4 | U  | < 0.4 | U | < 0.4 | U |
| n-Propylbenzene  | µg/L  | 4,100           | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| o-Xylene   | µg/L  | 10,000          | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| p-Isopropyltoluene   | µg/L  | 10,000          | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| sec-Butylbenzene   | µg/L  | 4,100           | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Styrene  | µg/L  | 100             | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| tert-Butylbenzene  | µg/L  | 4,100           | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Tetrachloroethene  | µg/L  | 5               | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Toluene  | µg/L  | 1,000           | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| trans-1,2-Dichloroethene   | µg/L  | 100             | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| trans-1,3-Dichloropropene  | µg/L  | 29              | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |
| Trichloroethene  | µg/L  | 5               | < 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  | 2.4   |   | 1.1   |    | 1     |   |       |   |
| Trichlorofluoromethane   | µg/L  | 31,000          | < 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  | < 0.3 | U | < 0.3 | U  | < 0.3 | U | < 0.3 | U |
| Vinyl chloride   | µg/L  | 2               | < 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 | < 0.2 | U  | < 0.2 | U | < 0.2 | U |

Table 2-3  
Groundwater Results 2018-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |        |                 | 67WW14        |          |               |          | 67WW15        |          |               |          | 67WW16I        |          |                |          |
|--|--------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|----------------|----------|
|  |        |                 | 67WW14-181022 |          | 67WW14-190502 |          | 67WW15-181023 |          | 67WW15-190503 |          | 67WW16I-181025 |          | 67WW16I-190501 |          |
|  |        |                 | 10/22/2018    |          | 5/2/2019      |          | 10/23/2018    |          | 5/3/2019      |          | 10/25/2018     |          | 5/1/2019       |          |
|  |        |                 | 20.85 - 21.08 |          | 18.78 - 19.02 |          | 24.23 - 24.44 |          | 22.04 - 22.23 |          | 24.03 - 24.22  |          | 21.8 - 21.98   |          |
|  |        |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG            |          | REG            |          |
| Parameter  | Units  | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result         | Val Qual |
| ANIONS   |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Chloride   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Nitrate  | mg/L   | 10              |               |          |               |          |               |          |               |          |                |          |                |          |
| Nitrogen, Nitrite (As N)   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Sulfate  | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Sulfide  | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| DHC  |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Dehalococcoides  | CEQ/mL |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| FIELD TESTS  |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Conductivity   | µS/cm  |                 | 2.09          |          | 2.17          |          | 1.80          |          | 1.93          |          | 1.53           |          | 1.50           |          |
| Dissolved oxygen   | mg/L   |                 | 0.66          |          | 0.27          |          | 0.16          |          | 2.85          |          | 0.14           |          | 1.63           |          |
| Oxidation-reduction potential  | mV     |                 | 274           |          | 228           |          | 253           |          | 231           |          | 41             |          | 18             |          |
| pH   | SU     |                 | 5.76          |          | 5.89          |          | 5.61          |          | 5.43          |          | 6.24           |          | 5.35           |          |
| Temperature  | C      |                 | 21.68         |          | 20.83         |          | 18.06         |          | 20.33         |          | 17.69          |          | 22.48          |          |
| Turbidity  | NTU    |                 | 0             |          | 30.6          |          | 2.1           |          | 0             |          | 7.6            |          | 1.9            |          |
| GASES  |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Carbon dioxide   | µg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Ethane   | µg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Ethylene   | µg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Methane  | µg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| GEN CHEMISTRY  |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Alkalinity   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Total inorganic carbon   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Total organic carbon   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| METALS   |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| Ferrous Iron   | mg/L   |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| VOLATILES  |        |                 |               |          |               |          |               |          |               |          |                |          |                |          |
| 1,1,1,2-Tetrachloroethane  | µg/L   | 110             | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 1,1,1-Trichloroethane  | µg/L   | 200             | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L   | 14              | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L   | 3,100,000       | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,2-Trichloroethane  | µg/L   | 5               | < 0.3         | U        | < 0.3         | U        | 6             |          | 5.4           |          | < 0.3          | U        | < 0.3          | U        |
| 1,1-Dichloroethane   | µg/L   | 10,000          | 1.3           |          | 1.4           |          | 13            |          | 9.2           |          | < 0.2          | U        | < 0.2          | U        |
| 1,1-Dichloroethene   | µg/L   | 7               | 6.6           |          | 5.3           |          | 670           |          | 330           |          | < 0.2          | U        | < 0.2          | U        |
| 1,1-Dichloropropene  | µg/L   | 2.9             | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 1,2,3-Trichlorobenzene   | µg/L   | 310             | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | UJ       | < 0.4          | U        |
| 1,2,3-Trichloropropane   | µg/L   | 0.041           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2,4-Trichlorobenzene   | µg/L   | 70              | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2,4-Trimethylbenzene   | µg/L   | 5,100           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L   | 0.2             | < 1           | U        | < 0.2         | U        | < 1           | U        | < 0.2         | U        | < 1            | U        | < 0.2          | U        |
| 1,2-Dibromoethane  | µg/L   | 0.05            | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| 1,2-Dichlorobenzene  | µg/L   | 600             | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2-Dichloroethane   | µg/L   | 5               | 2.5           |          | 1.8           |          | 30            |          | 22            |          | < 0.2          | U        | < 0.2          | U        |
| 1,2-Dichloropropane  | µg/L   | 5               | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 1,3,5-Trimethylbenzene   | µg/L   | 5,100           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 1,3-Dichlorobenzene  | µg/L   | 3,100           | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| 1,3-Dichloropropane  | µg/L   | 29              | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 1,4-Dichlorobenzene  | µg/L   | 75              | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| 2,2-Dichloropropane  | µg/L   | 42              | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| 2-Butanone   | µg/L   | 61,000          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| 2-Chlorotoluene  | µg/L   | 2,000           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| 2-Hexanone   | µg/L   | 6,100           | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1            | U        | < 1            | U        |
| 4-Chlorotoluene  | µg/L   | 2,000           | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |



Table 2-3  
Groundwater Results 2018-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |       |                 | 67WW14        |          |               |          | 67WW15        |          |               |          | 67WW16I        |          |                |          |
|--|-------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|----------------|----------|
|  |       |                 | 67WW14-181022 |          | 67WW14-190502 |          | 67WW15-181023 |          | 67WW15-190503 |          | 67WW16I-181025 |          | 67WW16I-190501 |          |
|  |       |                 | 10/22/2018    |          | 5/2/2019      |          | 10/23/2018    |          | 5/3/2019      |          | 10/25/2018     |          | 5/1/2019       |          |
|  |       |                 | 20.85 - 21.08 |          | 18.78 - 19.02 |          | 24.23 - 24.44 |          | 22.04 - 22.23 |          | 24.03 - 24.22  |          | 21.8 - 21.98   |          |
|  |       |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG            |          | REG            |          |
| Parameter  | Units | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result         | Val Qual |
| Acetone  | µg/L  | 92,000          | < 2           | U        | < 0.4         | U        | < 2           | U        | < 0.4         | U        | < 2            | U        | 3.3            |          |
| Benzene  | µg/L  | 5               | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Bromobenzene   | µg/L  | 2,000           | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| Bromochloromethane   | µg/L  | 4,100           | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Bromodichloromethane   | µg/L  | 4.6             | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Bromoform  | µg/L  | 36              | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| Bromomethane   | µg/L  | 140             | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| Carbon disulfide   | µg/L  | 10,000          | < 0.6         | U        | < 0.6         | U        | < 0.6         | U        | < 0.6         | U        | < 0.6          | U        | 0.9            | J        |
| Carbon tetrachloride   | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| Chlorobenzene  | µg/L  | 100             | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Chloroethane   | µg/L  | 41,000          | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Chloroform   | µg/L  | 1,000           | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Chloromethane  | µg/L  | 220             | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70              | < 0.2         | U        | < 0.2         | U        | 1.7           |          | 1.3           |          | < 0.2          | U        | < 0.2          | U        |
| cis-1,3-Dichloropropene  | µg/L  | 5.3             | < 0.1         | U        | < 0.1         | U        | < 0.1         | U        | < 0.1         | U        | < 0.1          | U        | < 0.1          | U        |
| Dibromochloromethane   | µg/L  | 34              | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Dibromomethane   | µg/L  | 380             | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Dichlorodifluoromethane  | µg/L  | 20,000          | < 0.3         | UJ       | < 0.3         | U        | < 0.3         | UJ       | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Ethylbenzene   | µg/L  | 700             | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Hexachlorobutadiene  | µg/L  | 20              | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1            | U        | < 1            | U        |
| Isopropylbenzene   | µg/L  | 10,000          | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| m,p-Xylenes  | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5          | U        | < 0.5          | U        |
| Methyl isobutyl ketone   | µg/L  | 8,200           | < 0.7         | U        | < 0.7         | U        | < 0.7         | U        | < 0.7         | U        | < 0.7          | U        | < 0.7          | U        |
| Methylene chloride   | µg/L  | 5               | < 1           | U        | < 0.4         | U        | < 1           | U        | < 0.4         | U        | < 1            | U        | < 0.4          | U        |
| Naphthalene  | µg/L  | 2,000           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | UJ       | < 0.3          | U        |
| n-Butylbenzene   | µg/L  | 4,100           | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4          | U        | < 0.4          | U        |
| n-Propylbenzene  | µg/L  | 4,100           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| o-Xylene   | µg/L  | 10,000          | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| p-Isopropyltoluene   | µg/L  | 10,000          | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| sec-Butylbenzene   | µg/L  | 4,100           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Styrene  | µg/L  | 100             | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| tert-Butylbenzene  | µg/L  | 4,100           | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Tetrachloroethene  | µg/L  | 5               | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Toluene  | µg/L  | 1,000           | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| trans-1,2-Dichloroethene   | µg/L  | 100             | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| trans-1,3-Dichloropropene  | µg/L  | 29              | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |
| Trichloroethene  | µg/L  | 5               | < 0.2         | U        | < 0.2         | U        | 1.4           |          | 1.1           |          | < 0.2          | U        | < 0.2          | U        |
| Trichlorofluoromethane   | µg/L  | 31,000          | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3          | U        | < 0.3          | U        |
| Vinyl chloride   | µg/L  | 2               | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2         | U        | < 0.2          | U        | < 0.2          | U        |

Notes:

**Bold and highlighted results indicate analyte is above the Res-GW MCL.**

µS/cm - microsiemens per centimeter

µg/L - micrograms per liter

°C - degrees Celsius

cells/mL - cells per milliliter

CEQ/mL - cell equivalence per milliliter

DHC - *Dehalococcoides*

FD - field duplicate

GW-Ind - groundwater medium-specific concentration for industrial use

ID - identification

J - estimated value

MCL - maximum contaminant level

mg/L - milligrams per liter

mS/cm - millisiemens per centimeter

mV - millivolts

NR - not recorded

NTU - nephelometric turbidity unit

REG - regular sample

Res-GW MCL - residential groundwater MCL

SU - standard unit

U - Not detected; The analyte was analyzed for but not detected above the associated method detection limit.

Val Qual - validation qualifier

VOC - volatile organic compound

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          | 67WW01          |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
|--|----------|-----------------|--------|---------------|---------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|---------|---------------|---------|---------------|--------|---------------|--------|---------------|--------|----------|
|  |          | 67WW01-050113   |        | 67WW01-053113 |         | 67WW01-050714 |        | 67WW01-072514 |        | 67WW01-120314 |        | 67WW01-021015 |        | 67WW01-051915 |         | 67WW01-111915 |         | 67WW01-032916 |        | 67WW01-051916 |        | 67WW01-112817 |        |          |
|  |          | 5/1/2013        |        | 5/31/2013     |         | 5/7/2014      |        | 7/25/2014     |        | 12/3/2014     |        | 2/10/2015     |        | 5/19/2015     |         | 11/19/2015    |         | 3/29/2016     |        | 5/19/2016     |        | 11/28/2017    |        |          |
|  |          | 0 - 0           |        | 0 - 0         |         | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |         | 0 - 0         |         | 0 - 0         |        | 0 - 0         |        | 25.95 - 25.99 |        |          |
|  |          | REG             |        | REG           |         | REG           |        | REG           |        | REG           |        | REG           |        | REG           |         | REG           |         | REG           |        | REG           |        | REG           |        |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result | Val Qual      | Result  | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result  | Val Qual      | Result  | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual |
| ANIONS   |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Chloride   | mg/L     |                 |        |               |         |               | 981    |               |        |               |        |               |        | 988           |         |               |         |               |        |               |        |               |        |          |
| Nitrate  | mg/L     | 10              |        |               |         |               | < 1    | U             |        |               |        |               |        | < 1           | U       |               |         |               |        |               |        |               |        |          |
| Nitrite  | mg/L     | 1               |        |               |         |               | < 1    | U             |        |               |        |               |        | 2.02          |         |               |         |               |        |               |        |               |        |          |
| DHC  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| BVC  | CEO/mL   |                 |        |               |         |               | 0.5    | U             |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Dehalococcoides  | cells/mL |                 |        |               |         |               | 4.7    |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| FIELD TESTS  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Conductivity   | µS/cm    |                 |        |               | 3.41    |               | 3.57   |               | 3.57   |               | 3.69   |               | 3.36   |               | 3.2     |               | 3.95    |               | 3.8    |               | 3.9    |               | 3.77   |          |
| Dissolved oxygen   | mg/L     |                 |        |               | 8.62    |               | 8.81   |               | 8.79   |               | NR     |               | NR     |               | NR      |               | NR      |               | NR     |               | NR     |               | NR     |          |
| Oxidation-Reduction Potential  | mV       |                 |        |               | 15      |               | 85     |               | 107    |               | -13    |               | -101   |               | -52     |               |         |               |        |               |        |               | 19     |          |
| pH   | SU       |                 |        |               | 5.84    |               | 5.52   |               | 5.91   |               | 6.15   |               | 6.92   |               | 7.11    |               | 6.19    |               | 5.57   |               | 6.28   |               | 6.47   |          |
| Temperature  | C        |                 |        |               | 28      |               | 19.77  |               | 21.9   |               | 17.6   |               | 18.85  |               | 21.65   |               | 16.27   |               | 15.38  |               | 17.86  |               | 17.22  |          |
| Turbidity  | NTU      |                 |        |               | 69.6    |               | 36.6   |               | 33     |               | 23.3   |               | 194    |               | 161     |               | 284     |               | 50.2   |               | 26.2   |               | 184    |          |
| GASES  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Carbon dioxide   | µg/L     |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Ethane   | µg/L     |                 |        |               |         |               | < 2    | U             |        |               |        |               |        | < 2           | U       |               |         |               |        |               |        |               |        |          |
| Ethylene   | µg/L     |                 |        |               |         |               | < 2    | U             |        |               |        |               |        | < 2           | U       |               |         |               |        |               |        |               |        |          |
| Methane  | µg/L     |                 |        |               |         |               | 33.5   |               |        |               |        |               |        | 20            |         |               |         |               |        |               |        |               |        |          |
| GENERAL CHEMISTRY  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Ferrous Iron   | mg/L     |                 |        |               |         |               | 5,690  |               |        |               |        |               |        | 53.9          |         |               |         |               |        |               |        |               |        |          |
| SULFIDE  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Sulfide  | mg/L     |                 |        |               |         |               | < 1    | U             |        |               |        |               |        | < 1           | U       |               |         |               |        |               |        |               |        |          |
| TOTAL ORGANIC CARBON   |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Total Inorganic Carbon   | mg/L     |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| Total organic carbon   | mg/L     |                 |        |               |         |               | 5.25   |               |        |               |        |               |        | 12.7          |         |               |         |               |        |               |        |               |        |          |
| VOLATILES  |          |                 |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        | < 1           | U      |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               |        |               | < 0.25  | U             | < 0.5  | U             | 0.29   | J             | 0.483  | J             | 1.44   |               | 1.72    | J             | 2.14    | J             | 2.67   |               | 1.62   | J             | < 1    | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          |        |               | 6.37    |               | 11     |               | 9.2    |               | 14.9   |               | 23.7   |               | 23.5    |               | 26.2    |               | 38.5   |               | 27.6   |               | 22     |          |
| 1,1-Dichloroethene   | µg/L     | 7               |        |               | 139     |               | 257    |               | 224    |               | 349    |               | 544    |               | 631     |               | 694     |               | 728    |               | 714    |               | 250    |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             |        |               | < 0.15  | U             | < 0.3  | U             | < 0.3  | U             | < 0.3  | U             | < 0.3  | U             | < 0.75  | U             | < 0.75  | U             | < 0.3  | U             | < 1.5  | U             | < 1    | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               |        |               | < 1     | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 5     | U             | < 5     | U             | < 2    | U             | < 10   | U             | < 1    | U        |
| 1,2-Dibromoethane  | µg/L     | 0               |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |
| 1,2-Dichloroethane   | µg/L     | 5               |        |               | 6.68    |               | 12.2   |               | 10.7   |               | 16.6   |               | 28.7   |               | 31.4    |               | 38.6    |               | 52.6   |               | 43.3   |               | 28     |          |
| 1,2-Dichloropropane  | µg/L     | 5               |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 1,3-Dichloropropane  | µg/L     | 29              |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |
| 2,2-Dichloropropane  | µg/L     | 42              |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |
| 2-Butanone   | µg/L     | 61,000          |        |               | < 2.5   | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 12.5  | U             | < 12.5  | U             | < 5    | U             | < 25   | U             | < 2    | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |       | 67WW01          |        |               |         |               |        |               |        |               |        |               |        |               |         |               |         |               |        |               |        |               |        |          |        |          |
|--|-------|-----------------|--------|---------------|---------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|---------|---------------|---------|---------------|--------|---------------|--------|---------------|--------|----------|--------|----------|
|  |       | 67WW01-050113   |        | 67WW01-053113 |         | 67WW01-050714 |        | 67WW01-072514 |        | 67WW01-120314 |        | 67WW01-021015 |        | 67WW01-051915 |         | 67WW01-111915 |         | 67WW01-032916 |        | 67WW01-051916 |        | 67WW01-112817 |        |          |        |          |
|  |       | 5/1/2013        |        | 5/31/2013     |         | 5/7/2014      |        | 7/25/2014     |        | 12/3/2014     |        | 2/10/2015     |        | 5/19/2015     |         | 11/19/2015    |         | 3/29/2016     |        | 5/19/2016     |        | 11/28/2017    |        |          |        |          |
|  |       | 0 - 0           |        | 0 - 0         |         | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |         | 0 - 0         |         | 0 - 0         |        | 0 - 0         |        | 25.95 - 25.99 |        |          |        |          |
|  |       | REG             |        | REG           |         | REG           |        | REG           |        | REG           |        | REG           |        | REG           |         | REG           |         | REG           |        | REG           |        | REG           |        |          |        |          |
| Parameter  | Units | MCL /<br>GW-Ind | Result | Val Qual      | Result  | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result  | Val Qual      | Result  | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual | Result | Val Qual |
| 2-Hexanone   | µg/L  | 6,100           |        |               | < 2.5   | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 12.5  | U             | < 12.5  | U             | < 5    | U             | < 25   | U             | < 2    | U        |        |          |
| 4-Chlorotoluene  | µg/L  | 2,000           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Acetone  | µg/L  | 92,000          |        |               | < 2.5   | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 12.5  | U             | < 12.5  | U             | < 5    | U             | < 25   | U             | < 2    | U        |        |          |
| Benzene  | µg/L  | 5               |        |               | < 0.125 | U             | < 0.14 | B             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | 0.168  | J             | < 1.25 | U             | < 1    | U        |        |          |
| Bromobenzene   | µg/L  | 2,000           |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |        |          |
| Bromochloromethane   | µg/L  | 4,100           |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |        |          |
| Bromodichloromethane   | µg/L  | 4.6             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Bromoform  | µg/L  | 36              |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |        |          |
| Bromomethane   | µg/L  | 140             |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | 1      | UJ            | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |        |          |
| Carbon disulfide   | µg/L  | 10,000          |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 2    | U        |        |          |
| Carbon tetrachloride   | µg/L  | 5               |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | 2.5    | UJ            | < 1    | U        |        |          |
| Chlorobenzene  | µg/L  | 100             |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |        |          |
| Chloroethane   | µg/L  | 41,000          |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |        |          |
| Chloroform   | µg/L  | 1,000           |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |        |          |
| Chloromethane  | µg/L  | 220             |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |        |          |
| cis-1,2-Dichloroethene   | µg/L  | 70              |        |               | 1.12    |               | 1.29   |               | 1.02   |               | 1.26   |               | 1.82   |               | 1.54    | J             | 1.6     | J             | 2.16   |               | 1.47   | J             | 1.3    |          |        |          |
| cis-1,3-Dichloropropene  | µg/L  | 5.3             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Dibromochloromethane   | µg/L  | 34              |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Dibromomethane   | µg/L  | 380             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Dichlorodifluoromethane  | µg/L  | 20,000          |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Ethylbenzene   | µg/L  | 700             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Hexachlorobutadiene  | µg/L  | 20              |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | 2.5    | UJ            | < 1    | U        |        |          |
| Isopropylbenzene   | µg/L  | 10,000          |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| m,p-Xylenes  | µg/L  | 10,000          |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 2    | U        |        |          |
| Methyl isobutyl ketone   | µg/L  | 8,200           |        |               | < 2.5   | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 12.5  | U             | < 12.5  | U             | < 5    | U             | < 25   | U             | < 2    | U        |        |          |
| Methylene chloride   | µg/L  | 5               |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 2    | U        |        |          |
| Naphthalene  | µg/L  | 2,000           |        |               | < 0.2   | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 0.4  | U             | < 1     | U             | < 1     | U             | < 0.4  | U             | < 2    | U             | < 1    | U        |        |          |
| n-Butylbenzene   | µg/L  | 4,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| n-Propylbenzene  | µg/L  | 4,100           |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |        |          |
| o-Xylene   | µg/L  | 10,000          |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| p-Isopropyltoluene   | µg/L  | 10,000          |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| sec-Butylbenzene   | µg/L  | 4,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Styrene  | µg/L  | 100             |        |               | < 0.125 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.25 | U             | < 0.626 | U             | < 0.626 | U             | < 0.25 | U             | < 1.25 | U             | < 1    | U        |        |          |
| tert-Butylbenzene  | µg/L  | 4,100           |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Tetrachloroethene  | µg/L  | 5               |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Toluene  | µg/L  | 1,000           |        |               | < 0.25  | U             | < 0.5  | U             | 0.473  | J             | 0.398  | J             | 0.287  | J             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| trans-1,2-Dichloroethene   | µg/L  | 100             |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| trans-1,3-Dichloropropene  | µg/L  | 29              |        |               | < 0.5   | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2.5   | U             | < 2.5   | U             | < 1    | U             | < 5    | U             | < 1    | U        |        |          |
| Trichloroethene  | µg/L  | 5               |        |               | 2.96    |               | 3      |               | 2.3    |               | 3.36   |               | 4.07   |               | 3.03    |               | 2.84    |               | 4      |               | 3.28   | J             | 2.1    |          |        |          |
| Trichlorofluoromethane   | µg/L  | 31,000          |        |               | < 0.25  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             | < 1.25  | U             | < 1.25  | U             | < 0.5  | U             | < 2.5  | U             | < 1    | U        |        |          |
| Vinyl chloride   | µg/L  | 2               |        |               | 2.18    |               | 2.15   |               | 1.16   |               | 2.16   |               | 2.38   |               | 1.86    | J             | 2.38    | J             | 3.64   |               | 2.98   | J             | < 1    | U        |        |          |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW01        |          |               |          | 67WW02        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------------|----------|---------------|----------|
|  |          |                 | 67WW01-180503 |          | 67WW01-190503 |          | 67WW02-050213 |          | 67WW02-053113 |          | 67WW02-092713 |          | 67WW02-012314 |          | 67WW02-050614 |          | 67WW02-072414 |          | 67WW02-120314 |          | 67WW02-021015 |          | 67WW02FD-051215 |          | 67WW02-051215 |          |
|  |          |                 | 5/3/2018      |          | 5/3/2019      |          | 5/2/2013      |          | 5/31/2013     |          | 9/27/2013     |          | 1/23/2014     |          | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015       |          | 5/12/2015     |          |
|  |          |                 | 24 - 24       |          | 22.97 - 23.23 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0           |          | 0 - 0         |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | FD              |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| DHC  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Conductivity   | µS/cm    |                 | 3.37          |          | 3.67          |          | 3.25          |          | 3.02          |          | 2.94          |          | 3.04          |          | 3             |          | 2.94          |          | 3.07          |          | 2.92          |          |                 |          |               |          |
| Dissolved oxygen   | mg/L     |                 | NR            |          | 0.46          |          | 3.4           |          | 8.68          |          | 10.06         |          | 5.81          |          | 6.54          |          | 8.83          |          |               |          |               |          |                 |          |               |          |
| Oxidation-Reduction Potential  | mV       |                 | 73            |          | 202           |          | 92            |          | -8            |          | 73            |          | -65           |          | 47            |          | 192           |          | 61            |          | -30           |          |                 |          |               |          |
| pH   | SU       |                 | 6.61          |          | 6.17          |          | 5.72          |          | 6.57          |          | 6.69          |          | 6.78          |          | 5.62          |          | 7.02          |          | 6.27          |          | 7.25          |          |                 |          |               |          |
| Temperature  | C        |                 | 19.98         |          | 19.81         |          | 20.58         |          | 27.07         |          | 25.23         |          | 16.2          |          | 21.01         |          | 22.38         |          | 19            |          | 19.49         |          |                 |          |               |          |
| Turbidity  | NTU      |                 | 67.6          |          | 100           |          | 78.4          |          | 51.4          |          | 21            |          | 49.7          |          | 106           |          | 11.6          |          | 19.3          |          | 8.9           |          |                 |          |               |          |
| GASES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| SULFIDE  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| VOLATILES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 200             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 14              | < 0.5         | U        | < 0.5         | U        |               |          | 0.2           | UJ       | < 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-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       | < 0.5         | U        | < 0.5         | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | 1.2           |          | 1.4           |          |               |          | < 0.25        | 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-Dichloroethane   | µg/L     | 10,000          | 15            |          | 12            |          |               |          | 0.507         | J        | 0.508         | J        | 0.406         | J        | 0.44          | J        | 0.335         | J        | 0.406         | J        | 0.592         | J        | 0.873           | J        | 0.883         | J        |
| 1,1-Dichloroethene   | µg/L     | 7               | 450           |          | 280           |          |               |          | < 0.5         | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | 3.59          |          | 13              |          | 13.2          |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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   | µg/L     | 310             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.15        | 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   | µg/L     | 0.041           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1             | U        | < 1           | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | 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   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 0               | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2             | U        | < 2           | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 600             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | 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   | µg/L     | 5               | 22            |          | 21            |          |               |          | < 0.25        | 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-Dichloropropane  | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | 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   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 3,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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  | µg/L     | 29              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | 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  | µg/L     | 75              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | 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  | µg/L     | 42              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | 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   | µg/L     | 61,000          | < 1           | U        | < 1           | U        |               |          | < 2.5         | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5             | U        | 5             | UJ       |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | 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        |



Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW02        |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          | 67WW03        |          |               |          | 67WW05        |          |               |          |
|--|----------|-----------------|---------------|----------|-----------------|----------|---------------|----------|---------------|----------|-----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |          |                 | 67WW02-111915 |          | 67WW02FD-051916 |          | 67WW02-051916 |          | 67WW02-112817 |          | 67WW02-180503FD |          | 67WW02-180503 |          | 67WW02-181025 |          | 67WW02-190501 |          | 67WW03-051215 |          | 67WW03-032916 |          | 67WW03-051916 |          | 67WW05-053113 |          |
|  |          |                 | 11/19/2015    |          | 5/19/2016       |          | 5/19/2016     |          | 11/28/2017    |          | 5/3/2018        |          | 5/3/2018      |          | 10/25/2018    |          | 5/1/2019      |          | 5/12/2015     |          | 3/29/2016     |          | 5/19/2016     |          | 5/31/2013     |          |
|  |          |                 | 0 - 0         |          | 0 - 0           |          | 0 - 0         |          | 23.95 - 27.78 |          | 24.15 - 24.15   |          | 24.15 - 24.15 |          | 24.35 - 24.6  |          | 22.42 - 22.67 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          |
|  |          |                 | REG           |          | FD              |          | REG           |          | REG           |          | FD              |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Chloride   | mg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Nitrate  | mg/L     | 10              |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Nitrite  | mg/L     | 1               |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| DHC  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| BVC  | CEO/mL   |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| FIELD TESTS  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Conductivity   | µS/cm    |                 | 3.33          |          |                 |          | 3.8           |          | 4.26          |          |                 |          | 3.87          |          | 4.0           |          | 4.03          |          |               |          |               |          |               |          |               |          |
| Dissolved oxygen   | mg/L     |                 |               |          |                 |          |               |          | 7.82          |          |                 |          | 8.6           |          | 1.27          |          | 0.27          |          |               |          |               |          |               |          |               |          |
| Oxidation-Reduction Potential  | mV       |                 |               |          |                 |          |               |          | 90            |          |                 |          | 155           |          | 129           |          | 73            |          |               |          |               |          |               |          |               |          |
| pH   | SU       |                 | 6.29          |          |                 |          | 6.08          |          | 6.12          |          |                 |          | 6.37          |          | 6.5           |          | 5.74          |          |               |          |               |          |               |          |               |          |
| Temperature  | C        |                 | 17.57         |          |                 |          | 18.37         |          | 15.93         |          |                 |          | 20.69         |          | 19.04         |          | 24            |          |               |          |               |          |               |          |               |          |
| Turbidity  | NTU      |                 | 49.3          |          |                 |          | 10.6          |          | 20.9          |          |                 |          | 14.3          |          | 1.1           |          | 0             |          |               |          |               |          |               |          |               |          |
| GASES  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ethane   | µg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ethylene   | µg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Methane  | µg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| SULFIDE  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Sulfide  | mg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| VOLATILES  |          |                 |               |          |                 |          |               |          |               |          |                 |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 0.4         | U        | < 0.4           | U        | < 0.4         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.2         | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |               |          |                 |          |               |          | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |               |          |               |          |               |          |               |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | 1.2           |          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | 0.302         | J        | 3.25            |          | 3.27          |          | < 1           | U        | 7.7             |          | 7.8           |          | < 0.5         | U        | 8.4           |          | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.125       | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | 0.857         | J        | 66.3            |          | 67.6          |          | < 1           | U        | 190             |          | 190           |          | 6.9           |          | 180           |          | < 1           | U        | < 1           | U        | < 1           | U        | < 0.5         | U        |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 0.3         | U        | < 0.3           | U        | < 0.3         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | UJ       | < 0.5         | U        | < 0.3         | U        | < 0.3         | U        | < 0.3         | U        | < 0.15        | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 1           | U        | < 1             | U        | < 1           | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 0.5         | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.4         | U        | < 0.4           | U        | < 0.4         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.2         | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 2           | U        | < 2             | U        | < 2           | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 1           | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 0.25        | U        | < 0.25          | U        | < 0.25        | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.125       | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | < 0.5         | U        | 0.321           | J        | 0.377         | J        | < 1           | U        | 1.9             |          | 2             |          | < 0.5         | U        | 4.7           |          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,2-Dichloropropane  | µg/L     | 5               | < 0.4         | U        | < 0.4           | U        | < 0.4         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.2         | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 0.4         | U        | < 0.4           | U        | < 0.4         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.2         | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 0.25        | U        | < 0.25          | U        | < 0.25        | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.125       | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        |
| 2-Butanone   | µg/L     | 61,000          | < 5           | U        | < 5             | U        | < 5           | U        | < 2           | U        | < 1             | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 2.5         | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.25        | U        | < 0.25          | U        | < 0.25        | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.125       | U        |



Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW05        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|------------------|----------|
|  |          |                 | 67WW05-092813 |          | 67WW05-012314 |          | 67WW05-050614 |          | 67WW05-072414 |          | 67WW05-120314 |          | 67WW05-021015 |          | 67WW05-051215 |          | 67WW05-111915 |          | 67WW05-051916 |          | 67WW05-112817 |          | 67WW05-180503 |          | 67WW05-181025-FD |          |
|  |          |                 | 9/28/2013     |          | 1/23/2014     |          | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 11/19/2015    |          | 5/19/2016     |          | 11/28/2017    |          | 5/3/2018      |          | 10/25/2018       |          |
|  |          |                 | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 25.6 - 25.6   |          | 25.08 - 25.08 |          | 25.8 - 26.07     |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | FD               |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result           | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Chloride   | mg/L     |                 |               |          |               |          | 697           |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| DHC  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Conductivity   | µS/cm    |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 2.75     |               | 2.45     |                  |          |
| Dissolved oxygen   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 7.47     |               | 9.51     |                  |          |
| Oxidation-Reduction Potential  | mV       |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 133      |               | 229      |                  |          |
| pH   | SU       |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 5.26     |               | 5.68     |                  |          |
| Temperature  | C        |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 16.09    |               | 20.63    |                  |          |
| Turbidity  | NTU      |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               | 301      |               | 54       |                  |          |
| GASES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| SULFIDE  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| VOLATILES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                  |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          | < 1           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 1           | U        | < 0.5         | U        | < 1              | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,2-Dichloropropane  | µg/L     | 5               | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 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           | U        | < 0.5         | U        | < 0.5            | U        |
| 2-Butanone   | µg/L     | 61,000          | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 2           | U        | < 1           | U        | < 1              | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 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           | U        | < 0.5         | U        | < 0.5            | U        |



Table 2-4  
Groundwater Results 2013-2019

| Location Code             |       | 67WW05          |               |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |          |  |
|---------------------------|-------|-----------------|---------------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|------------------|--------|----------|--|
|                           |       | Sample ID       | 67WW05-092813 | 67WW05-012314 |        | 67WW05-050614 |        | 67WW05-072414 |        | 67WW05-120314 |        | 67WW05-021015 |        | 67WW05-051215 |        | 67WW05-111915 |        | 67WW05-051916 |        | 67WW05-112817 |        | 67WW05-180503 |        | 67WW05-181025-FD |        |          |  |
|                           |       | Sample Date     | 9/28/2013     | 1/23/2014     |        | 5/6/2014      |        | 7/24/2014     |        | 12/3/2014     |        | 2/10/2015     |        | 5/12/2015     |        | 11/19/2015    |        | 5/19/2016     |        | 11/28/2017    |        | 5/3/2018      |        | 10/25/2018       |        |          |  |
|                           |       | Depth           | 0 - 0         | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 25.6 - 25.6   |        | 25.08 - 25.08 |        | 25.8 - 26.07     |        |          |  |
|                           |       | Sample Purpose  | REG           | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | FD               |        |          |  |
| Parameter                 | Units | MCL /<br>GW-Ind | Result        | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual         | Result | Val Qual |  |
| 2-Hexanone                | µg/L  | 6,100           | < 5           | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | 5      | UJ            | < 5    | U             | < 5    | U             | < 2    | U             | < 1    | U                | < 1    | U        |  |
| 4-Chlorotoluene           | µg/L  | 2,000           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Acetone                   | µg/L  | 92,000          | < 5           | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 2    | U             | < 1    | U                | < 2    | U        |  |
| Benzene                   | µg/L  | 5               | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Bromobenzene              | µg/L  | 2,000           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Bromochloromethane        | µg/L  | 4,100           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Bromodichloromethane      | µg/L  | 4.6             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Bromoform                 | µg/L  | 36              | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Bromomethane              | µg/L  | 140             | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Carbon disulfide          | µg/L  | 10,000          | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2    | U             | < 1    | U                | < 1    | U        |  |
| Carbon tetrachloride      | µg/L  | 5               | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Chlorobenzene             | µg/L  | 100             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Chloroethane              | µg/L  | 41,000          | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Chloroform                | µg/L  | 1,000           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Chloromethane             | µg/L  | 220             | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 0.5  | U                | < 0.5  | U        |  |
| cis-1,2-Dichloroethene    | µg/L  | 70              | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| cis-1,3-Dichloropropene   | µg/L  | 5.3             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Dibromochloromethane      | µg/L  | 34              | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Dibromomethane            | µg/L  | 380             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Dichlorodifluoromethane   | µg/L  | 20,000          | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Ethylbenzene              | µg/L  | 700             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Hexachlorobutadiene       | µg/L  | 20              | < 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    | U             | < 0.5  | U                | < 1    | U        |  |
| Isopropylbenzene          | µg/L  | 10,000          | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| m,p-Xylenes               | µg/L  | 10,000          | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 2    | U             | < 1    | U                | < 1    | U        |  |
| Methyl isobutyl ketone    | µg/L  | 8,200           | < 5           | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 2    | U             | < 1    | U                | < 1    | U        |  |
| Methylene chloride        | µg/L  | 5               | < 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    | U             | < 1    | U                | < 1    | U        |  |
| Naphthalene               | µg/L  | 2,000           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| n-Butylbenzene            | µg/L  | 4,100           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| n-Propylbenzene           | µg/L  | 4,100           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| o-Xylene                  | µg/L  | 10,000          | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| p-Isopropyltoluene        | µg/L  | 10,000          | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| sec-Butylbenzene          | µg/L  | 4,100           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Styrene                   | µg/L  | 100             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| tert-Butylbenzene         | µg/L  | 4,100           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Tetrachloroethene         | µg/L  | 5               | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Toluene                   | µg/L  | 1,000           | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| trans-1,2-Dichloroethene  | µg/L  | 100             | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| trans-1,3-Dichloropropene | µg/L  | 29              | < 1           | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Trichloroethene           | µg/L  | 5               | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Trichlorofluoromethane    | µg/L  | 31,000          | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |
| Vinyl chloride            | µg/L  | 2               | < 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    | U             | < 0.5  | U                | < 0.5  | U        |  |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW05        |          |               |          | 67WW06        |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          | 67WW07        |          |               |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|------------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |          |                 | 67WW05-181025 |          | 67WW05-190502 |          | 67WW06-043013 |          | 67WW06-053113 |          | 67WW06-053113-FD |          | 67WW06-092813 |          | 67WW06-012414 |          | 67WW06-161215 |          | 67WW06-112917 |          | 67WW07-053113 |          | 67WW07-092713 |          | 67WW07-012314 |          |
|  |          |                 | 10/25/2018    |          | 5/2/2019      |          | 4/30/2013     |          | 5/31/2013     |          | 5/31/2013        |          | 9/28/2013     |          | 1/24/2014     |          | 12/16/2015    |          | 11/29/2017    |          | 5/31/2013     |          | 9/27/2013     |          | 1/23/2014     |          |
|  |          |                 | 25.8 - 26.07  |          | 24.46 - 24.68 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0            |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 24.66 - 24.87 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | FD               |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| DHC  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Conductivity   | µS/cm    |                 | 2.75          |          | 2.65          |          | 6.38          |          | 6.37          |          |                  |          | 6.45          |          | 7.09          |          | 6.13          |          | 5.36          |          |               |          |               |          |               |          |
| Dissolved oxygen   | mg/L     |                 | 0.11          |          | 1.99          |          | 0             |          | 1.57          |          |                  |          | 0.82          |          | 0.8           |          | 0             |          | 0.1           |          |               |          |               |          |               |          |
| Oxidation-Reduction Potential  | mV       |                 | 172           |          | 247           |          | 82            |          | 22            |          |                  |          | 13            |          | 67            |          | 56            |          | 204           |          |               |          |               |          |               |          |
| pH   | SU       |                 | 5.17          |          | 4.11          |          | 5.01          |          | 5.27          |          |                  |          | 5.45          |          | 5.58          |          | 5.74          |          | 5.11          |          |               |          |               |          |               |          |
| Temperature  | C        |                 | 17.93         |          | 20.1          |          | 24.95         |          | 24.28         |          |                  |          | 20.2          |          | 15.42         |          | 19.27         |          | 18.57         |          |               |          |               |          |               |          |
| Turbidity  | NTU      |                 | 21.3          |          | 55.2          |          | 9.7           |          | 13.4          |          |                  |          | 5.5           |          | 42.9          |          | 36.2          |          | 150           |          |               |          |               |          |               |          |
| GASES  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| SULFIDE  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| VOLATILES  |          |                 |               |          |               |          |               |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | 0.2           | UJ       | < 0.4         | U        | < 0.4         | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       | < 0.5         | U        | < 0.5         | U        |               |          |               |          |                  |          |               |          |               |          |               |          | < 1           | U        |               |          |               |          |               |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | < 0.5         | U        | < 0.5         | U        |               |          | 0.212         | J        | 0.193            | J        | < 0.25        | U        | 0.234         | J        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | 0.752         | J        |               |          | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 0.5         | UJ       | < 0.5         | U        |               |          | < 0.15        | U        | < 0.15           | U        | < 0.3         | U        | < 0.3         | U        |               |          | < 1           | U        | < 0.15        | U        | < 0.3         | U        | < 0.3         | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | < 0.2         | U        | < 0.4         | U        | < 0.4         | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 1           | U        | < 0.5         | U        |               |          | < 1           | U        | < 1              | U        | < 2           | U        | 2             | UJ       |               |          | < 1           | U        | 1             | UJ       | < 2           | U        | < 2           | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        |               |          | 2.25          |          | 2.2              |          | 1.77          |          | 2.03          |          |               |          | 1             |          | 1.67          |          | 1.77          |          | 1.35          |          |
| 1,2-Dichloropropane  | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | < 0.2         | U        | < 0.4         | U        | < 0.4         | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | < 0.2         | U        | < 0.4         | U        | < 0.4         | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| 2-Butanone   | µg/L     | 61,000          | < 1           | U        | < 1           | U        |               |          | < 2.5         | U        | < 2.5            | U        | < 5           | U        | < 5           | U        |               |          | < 2           | U        | < 2.5         | U        | < 5           | U        | < 5           | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |       |                 | 67WW05        |          |               |          | 67WW06        |          |               |          |                  |          |               |          |               |          |               |          |               |          |               |          | 67WW07        |          |               |          |
|--|-------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|------------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |       |                 | 67WW05-181025 |          | 67WW05-190502 |          | 67WW06-043013 |          | 67WW06-053113 |          | 67WW06-053113-FD |          | 67WW06-092813 |          | 67WW06-012414 |          | 67WW06-161215 |          | 67WW06-112917 |          | 67WW07-053113 |          | 67WW07-092713 |          | 67WW07-012314 |          |
|  |       |                 | 10/25/2018    |          | 5/2/2019      |          | 4/30/2013     |          | 5/31/2013     |          | 5/31/2013        |          | 9/28/2013     |          | 1/24/2014     |          | 12/16/2015    |          | 11/29/2017    |          | 5/31/2013     |          | 9/27/2013     |          | 1/23/2014     |          |
|  |       |                 | 25.8 - 26.07  |          | 24.46 - 24.68 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0            |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 24.66 - 24.87 |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          |
|  |       |                 | REG           |          | REG           |          | REG           |          | REG           |          | FD               |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 2-Hexanone   | µg/L  | 6,100           | < 1           | U        | < 1           | U        |               |          | < 2.5         | U        | < 2.5            | U        | < 5           | U        | < 5           | U        |               |          | < 2           | U        | < 2.5         | U        | < 5           | U        | < 5           | U        |
| 4-Chlorotoluene  | µg/L  | 2,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Acetone  | µg/L  | 92,000          | < 2           | U        | < 3.8         | U        |               |          | 2.5           | UJ       | 2.5              | UJ       | < 5           | U        | < 5           | U        |               |          | < 2           | U        | < 2.5         | U        | < 5           | U        | < 5           | U        |
| Benzene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| Bromobenzene   | µg/L  | 2,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| Bromochloromethane   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | < 0.2         | U        | < 0.4         | U        | < 0.4         | U        |
| Bromodichloromethane   | µg/L  | 4.6             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Bromoform  | µg/L  | 36              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| Bromomethane   | µg/L  | 140             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | 1             | UJ       | < 1           | U        |               |          | < 1           | U        | 0.5           | UJ       | < 1           | U        | < 1           | U        |
| Carbon disulfide   | µg/L  | 10,000          | < 1           | U        | < 1           | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 2           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| Carbon tetrachloride   | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Chlorobenzene  | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| Chloroethane   | µg/L  | 41,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| Chloroform   | µg/L  | 1,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| Chloromethane  | µg/L  | 220             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 1           | U        | 0.5           | UJ       | < 1           | U        | < 1           | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| cis-1,3-Dichloropropene  | µg/L  | 5.3             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Dibromochloromethane   | µg/L  | 34              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Dibromomethane   | µg/L  | 380             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Dichlorodifluoromethane  | µg/L  | 20,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Ethylbenzene   | µg/L  | 700             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Hexachlorobutadiene  | µg/L  | 20              | < 1           | U        | < 1           | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Isopropylbenzene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| m,p-Xylenes  | µg/L  | 10,000          | < 1           | U        | < 1           | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 2           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| Methyl isobutyl ketone   | µg/L  | 8,200           | < 1           | U        | < 1           | U        |               |          | < 2.5         | U        | < 2.5            | U        | < 5           | U        | < 5           | U        |               |          | < 2           | U        | < 2.5         | U        | < 5           | U        | < 5           | U        |
| Methylene chloride   | µg/L  | 5               | < 1           | U        | < 1           | U        |               |          | 0.918         | J        | 0.846            | J        | 0.966         | J        | < 0.5         | U        |               |          | < 2           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Naphthalene  | µg/L  | 2,000           | < 0.5         | UJ       | < 0.5         | U        |               |          | < 0.2         | U        | < 0.2            | U        | < 0.4         | U        | < 0.4         | U        |               |          | < 1           | U        | < 0.2         | U        | < 0.4         | U        | < 0.4         | U        |
| n-Butylbenzene   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| n-Propylbenzene  | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| o-Xylene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| p-Isopropyltoluene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| sec-Butylbenzene   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Styrene  | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.125       | U        | < 0.125          | U        | < 0.25        | U        | < 0.25        | U        |               |          | < 1           | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        |
| tert-Butylbenzene  | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Tetrachloroethene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Toluene  | µg/L  | 1,000           | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| trans-1,2-Dichloroethene   | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| trans-1,3-Dichloropropene  | µg/L  | 29              | < 0.5         | U        | < 0.5         | U        |               |          | < 0.5         | U        | < 0.5            | U        | < 1           | U        | < 1           | U        |               |          | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        |
| Trichloroethene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Trichlorofluoromethane   | µg/L  | 31,000          | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |
| Vinyl chloride   | µg/L  | 2               | < 0.5         | U        | < 0.5         | U        |               |          | < 0.25        | U        | < 0.25           | U        | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        |





Table 2-4  
Groundwater Results 2013-2019

| Location Code                         |          | 67WW08          |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
|---------------------------------------|----------|-----------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|------------------|--------|---------------|--------|---------------|--|
|                                       |          | Sample ID       |        | 67WW08-100213 |        | 67WW08-012314 |        | 67WW08-050714 |        | 67WW08-072414 |        | 67WW08-120414 |        | 67WW08-021115 |        | 67WW08-051915 |        | 67WW08-111915 |        | 67WW08-051916 |        | 67WW08-112817-FD |        | 67WW08-112817 |        | 67WW08-180501 |  |
|                                       |          | Sample Date     |        | 10/2/2013     |        | 1/23/2014     |        | 5/7/2014      |        | 7/24/2014     |        | 12/4/2014     |        | 2/11/2015     |        | 5/19/2015     |        | 11/19/2015    |        | 5/19/2016     |        | 11/28/2017       |        | 11/28/2017    |        | 5/1/2018      |  |
|                                       |          | Depth           |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 24 - 24.17       |        | 24 - 24.17    |        | 22.99 - 23.12 |  |
|                                       |          | Sample Purpose  |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | FD               |        | REG           |        | REG           |  |
| Parameter                             | Units    | MCL /<br>GW-Ind | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual         | Result | Val Qual      | Result | Val Qual      |  |
| ANIONS                                |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Chloride                              | mg/L     |                 | 1360   |               | 1490   |               | 1380   |               | 1340   |               | 1410   | H1            | 1250   |               | 1750   |               | 1400   |               | 1510   |               | 1590   |                  | 1600   |               | 1530   |               |  |
| Nitrate                               | mg/L     | 10              | < 2    | U             | < 2    | U             | < 2    | U             | < 1    | U             | 2      | U             | < 4    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 0.1  | U                | < 0.1  | U             | < 0.1  | U             |  |
| Nitrite                               | mg/L     | 1               | < 2    | U             | < 2    | U             | < 2    | U             | < 1    | U             | 2.04   | J             | < 4    | U             | 3.95   | J             | < 2    | U             | < 2    | U             | < 0.1  | U                | < 0.1  | U             | < 0.1  | U             |  |
| DHC                                   |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| BVC                                   | CEO/mL   |                 | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Dehalococcoides                       | cells/mL |                 | 0.5    | U             | < 0.5  | U             | 0.6    |               |        |               |        |               |        |               |        |               |        |               |        |               | < 0.5  | U                | < 0.5  | U             | 0.2    |               |  |
| FIELD TESTS                           |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Conductivity                          | µS/cm    |                 | 5.11   |               | 5.08   |               | 5.43   |               | 4.98   |               | 5.07   |               | 4.38   |               | 5.85   |               | 5.06   |               | 5.42   |               |        |                  | 5.83   |               | 5.61   |               |  |
| Dissolved oxygen                      | mg/L     |                 | 0.74   |               | 0.38   |               | 0.45   |               | 0      |               | 0      |               | 0      |               | 0.66   |               | 0.44   |               | 0.82   |               |        |                  | 0.26   |               | 0      |               |  |
| Oxidation-Reduction Potential         | mV       |                 | -165   |               | -90    |               | -32    |               | -7     |               | -1     |               | 45     |               | -16    |               | 113    |               | 129    |               |        |                  | 186    |               | 250    |               |  |
| pH                                    | SU       |                 | 6.47   |               | 6.8    |               | 5.55   |               | 6.89   |               | 6.42   |               | 6.61   |               | 6.53   |               | 6.13   |               | 5.79   |               |        |                  | 5.88   |               | 6.68   |               |  |
| Temperature                           | C        |                 | 21.82  |               | 17.22  |               | 19.33  |               | 21.72  |               | 19.14  |               | 18.75  |               | 20.12  |               | 19.15  |               | 18.74  |               |        |                  | 19.04  |               | 22.03  |               |  |
| Turbidity                             | NTU      |                 | 1.5    |               | 0.6    |               | 9.7    |               | 6.1    |               | 2.7    |               | 3.7    |               | 67.1   |               | 45.3   |               | 9.3    |               |        |                  | 21.3   |               | 6.5    |               |  |
| GASES                                 |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Carbon dioxide                        | µg/L     |                 |        |               |        |               |        |               |        |               | 89600  |               |        |               |        |               |        |               |        |               | 240000 |                  | 290000 |               | 420000 |               |  |
| Ethane                                | µg/L     |                 | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 0.23 | U                | < 0.23 | U             | < 0.47 | U             |  |
| Ethylene                              | µg/L     |                 | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 2    | U             | < 0.22 | U                | < 0.22 | U             | < 0.55 | UJ            |  |
| Methane                               | µg/L     |                 | < 9.49 |               | 7.79   |               | 6.97   |               | 6.47   |               | 14.4   |               | 9.4    |               | 5.16   |               | 12.1   |               | 11.3   |               | 1.6    | J                | 2      | J             | 2.1    |               |  |
| GENERAL CHEMISTRY                     |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Ferrous Iron                          | mg/L     |                 | 161    |               | 0.344  |               | 282    |               | 227    |               | 0.374  |               | 0.0907 |               | 0.944  |               | 93.1   |               | 58.5   |               |        |                  |        |               | 0.063  | J             |  |
| SULFIDE                               |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Sulfide                               | mg/L     |                 | < 1    | U             | < 1    | U             | < 1    | U             |        |               |        |               | < 1    | U             | < 1    | U             | < 1    | U             | < 1    | U             | 1.48   | J                | 1.48   | J             | < 1.5  | U             |  |
| TOTAL ORGANIC CARBON                  |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| Total Inorganic Carbon                | mg/L     |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               | 140    |                  | 130    |               | 150    |               |  |
| Total organic carbon                  | mg/L     |                 | 6.32   |               | 9.95   |               | 10.6   |               | 7.58   |               | 3.68   |               | 22.4   |               | 8.32   |               | 47.5   |               | 65.4   |               | 4      |                  | 3.99   |               | 4.14   |               |  |
| VOLATILES                             |          |                 |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
| 1,1,1,2-Tetrachloroethane             | µg/L     | 110             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,1,1-Trichloroethane                 | µg/L     | 200             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,1,2,2-Tetrachloroethane             | µg/L     | 14              | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | µg/L     | 3,100,000       |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,1,2-Trichloroethane                 | µg/L     | 5               | 5.08   | J             | 6.7    |               | 5.01   | J             | 7.74   | J             | 7.36   | J             | 6.96   | J             | 4.5    | J             | 4.67   | J             | 2.76   | J             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,1-Dichloroethane                    | µg/L     | 10,000          | 46.5   |               | 54.4   |               | 57.3   |               | 56.7   |               | 63.9   |               | 61.1   |               | 52.1   |               | 48.1   |               | 31.9   |               | 18     |                  | 15     |               | 14     |               |  |
| 1,1-Dichloroethene                    | µg/L     | 7               | 1120   |               | 1340   |               | 1590   |               | 1890   |               | 2320   |               | 1930   |               | 1570   |               | 1710   |               | 1130   |               | 350    |                  | 340    |               | 300    |               |  |
| 1,1-Dichloropropene                   | µg/L     | 2.9             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2,3-Trichlorobenzene                | µg/L     | 310             | < 3    | U             | < 1.5  | U             | < 3    | U             | < 3    | U             | < 3    | U             | < 3    | U             | < 3    | U             | < 3    | U             | < 3    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2,3-Trichloropropane                | µg/L     | 0.041           | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2,4-Trichlorobenzene                | µg/L     | 70              | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2,4-Trimethylbenzene                | µg/L     | 5,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2-Dibromo-3-chloropropane           | µg/L     | 0               | < 20   | U             | < 10   | U             | < 20   | U             | < 20   | U             | < 20   | U             | < 20   | U             | < 20   | U             | < 20   | U             | < 20   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2-Dibromoethane                     | µg/L     | 0               | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2-Dichlorobenzene                   | µg/L     | 600             | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,2-Dichloroethane                    | µg/L     | 5               | 76.5   |               | 89.9   |               | 101    |               | 98.9   |               | 106    |               | 104    |               | 85.6   |               | 77.6   |               | 56.1   |               | 13     |                  | 13     |               | 11     |               |  |
| 1,2-Dichloropropane                   | µg/L     | 5               | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,3,5-Trimethylbenzene                | µg/L     | 5,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,3-Dichlorobenzene                   | µg/L     | 3,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,3-Dichloropropane                   | µg/L     | 29              | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 1,4-Dichlorobenzene                   | µg/L     | 75              | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 2,2-Dichloropropane                   | µg/L     | 42              | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| 2-Butanone                            | µg/L     | 61,000          | < 50   | U             | < 25   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| 2-Chlorotoluene                       | µg/L     | 2,000           | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |

Table 2-4  
Groundwater Results 2013-2019

| Location Code             |       | 67WW08          |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |               |        |                  |        |               |        |               |  |
|---------------------------|-------|-----------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--------|------------------|--------|---------------|--------|---------------|--|
|                           |       | Sample ID       |        | 67WW08-100213 |        | 67WW08-012314 |        | 67WW08-050714 |        | 67WW08-072414 |        | 67WW08-120414 |        | 67WW08-021115 |        | 67WW08-051915 |        | 67WW08-111915 |        | 67WW08-051916 |        | 67WW08-112817-FD |        | 67WW08-112817 |        | 67WW08-180501 |  |
|                           |       | Sample Date     |        | 10/2/2013     |        | 1/23/2014     |        | 5/7/2014      |        | 7/24/2014     |        | 12/4/2014     |        | 2/11/2015     |        | 5/19/2015     |        | 11/19/2015    |        | 5/19/2016     |        | 11/28/2017       |        | 11/28/2017    |        | 5/1/2018      |  |
|                           |       | Depth           |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 24 - 24.17       |        | 24 - 24.17    |        | 22.99 - 23.12 |  |
|                           |       | Sample Purpose  |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | REG           |        | FD               |        | REG           |        | REG           |  |
| Parameter                 | Units | MCL /<br>GW-Ind | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual         | Result | Val Qual      | Result | Val Qual      |  |
| 2-Hexanone                | µg/L  | 6,100           | < 50   | U             | < 25   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| 4-Chlorotoluene           | µg/L  | 2,000           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Acetone                   | µg/L  | 92,000          | < 50   | U             | < 25   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| Benzene                   | µg/L  | 5               | < 2.5  | U             | < 1.25 | U             | < 3.37 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Bromobenzene              | µg/L  | 2,000           | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Bromochloromethane        | µg/L  | 4,100           | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Bromodichloromethane      | µg/L  | 4.6             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Bromoform                 | µg/L  | 36              | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Bromomethane              | µg/L  | 140             | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Carbon disulfide          | µg/L  | 10,000          | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| Carbon tetrachloride      | µg/L  | 5               | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Chlorobenzene             | µg/L  | 100             | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Chloroethane              | µg/L  | 41,000          | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Chloroform                | µg/L  | 1,000           | 2.66   | UJ            | 4.11   | J             | 4.88   | J             | 5.13   | J             | 2.53   | J             | 2.57   | J             | 3.04   | J             | 1.61   | J             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Chloromethane             | µg/L  | 220             | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| cis-1,2-Dichloroethene    | µg/L  | 70              | < 5    | U             | 2.73   | J             | < 5    | U             | < 5    | U             | 2.69   | J             | 2.71   | J             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| cis-1,3-Dichloropropene   | µg/L  | 5.3             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Dibromochloromethane      | µg/L  | 34              | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Dibromomethane            | µg/L  | 380             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Dichlorodifluoromethane   | µg/L  | 20,000          | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Ethylbenzene              | µg/L  | 700             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Hexachlorobutadiene       | µg/L  | 20              | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | 5      | UJ            | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Isopropylbenzene          | µg/L  | 10,000          | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| m,p-Xylenes               | µg/L  | 10,000          | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| Methyl isobutyl ketone    | µg/L  | 8,200           | < 50   | U             | < 25   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 50   | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| Methylene chloride        | µg/L  | 5               | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | 3.42   | J             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 2    | U                | < 2    | U             | < 1    | U             |  |
| Naphthalene               | µg/L  | 2,000           | < 4    | U             | < 2    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 4    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| n-Butylbenzene            | µg/L  | 4,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| n-Propylbenzene           | µg/L  | 4,100           | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| o-Xylene                  | µg/L  | 10,000          | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| p-Isopropyltoluene        | µg/L  | 10,000          | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| sec-Butylbenzene          | µg/L  | 4,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Styrene                   | µg/L  | 100             | < 2.5  | U             | < 1.25 | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 2.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| tert-Butylbenzene         | µg/L  | 4,100           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Tetrachloroethene         | µg/L  | 5               | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Toluene                   | µg/L  | 1,000           | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| trans-1,2-Dichloroethene  | µg/L  | 100             | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| trans-1,3-Dichloropropene | µg/L  | 29              | < 10   | U             | < 5    | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 10   | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Trichloroethene           | µg/L  | 5               | < 5    | U             | 3.12   | J             | 4.41   | J             | 3.14   | J             | 3.55   | J             | 3.15   | J             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Trichlorofluoromethane    | µg/L  | 31,000          | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |
| Vinyl chloride            | µg/L  | 2               | < 5    | U             | < 2.5  | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 5    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             |  |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW08        |          |                  |          |               |          | 67WW09        |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
|--|----------|-----------------|---------------|----------|------------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------------|----------|---------------|----------|
|  |          |                 | 67WW08-181023 |          | 67WW08-181023-FD |          | 67WW08-190501 |          | 67WW10-060113 |          | 67WW09-060113 |          | 67WW09-092813 |          | 67WW09-012414 |          | 67WW09-072514 |          | 67WW09-120414 |          | 67WW09-021115 |          | 67WW09FD-021115 |          | 67WW09-051915 |          |
|  |          |                 | 10/23/2018    |          | 10/23/2018       |          | 5/1/2019      |          | 6/1/2013      |          | 6/3/2013      |          | 9/28/2013     |          | 1/24/2014     |          | 7/25/2014     |          | 12/4/2014     |          | 2/11/2015     |          | 2/11/2015       |          | 5/19/2015     |          |
|  |          |                 | 24.41 - 24.62 |          | 24.41 - 24.62    |          | 21.67 - 21.9  |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0           |          | 0 - 0         |          |
|  |          |                 | REG           |          | FD               |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | FD              |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Chloride   | mg/L     |                 | 1820          |          | 1770             |          | 1680          |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Nitrate  | mg/L     | 10              | < 0.2         | U        | < 0.2            | U        | < 0.5         | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Nitrite  | mg/L     | 1               | < 0.2         | U        | < 0.2            | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| DHC  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| BVC  | CEO/mL   |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Dehalococcoides  | cells/mL |                 | 9.3           |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| FIELD TESTS  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Conductivity   | µS/cm    |                 | 6.29          |          |                  |          | 6.28          |          | 3.31          |          |               |          | 3.47          |          | 3.39          |          | 3.42          |          | 3.55          |          | 3.29          |          |                 |          | 3.35          |          |
| Dissolved oxygen   | mg/L     |                 | 0.08          |          |                  |          | 0.08          |          | 0.52          |          |               |          | 0.83          |          | 0.86          |          | 0.61          |          | 0             |          | 1.02          |          |                 |          | 1.13          |          |
| Oxidation-Reduction Potential  | mV       |                 | 150           |          |                  |          | 138           |          | 189           |          |               |          | 157           |          | 136           |          | 310           |          | 166           |          | 164           |          |                 |          | 259           |          |
| pH   | SU       |                 | 6.33          |          |                  |          | 5.82          |          | 6.64          |          |               |          | 6.31          |          | 6.24          |          | 5.41          |          | 5.95          |          | 6.45          |          |                 |          | 5.48          |          |
| Temperature  | C        |                 | 18.14         |          |                  |          | 20.44         |          | 27.95         |          |               |          | 22.22         |          | 16.27         |          | 26.09         |          | 20.48         |          | 18.13         |          |                 |          | 18.88         |          |
| Turbidity  | NTU      |                 | 0             |          |                  |          | 0             |          | 4.5           |          |               |          | 1.7           |          | 0.9           |          | 4.4           |          | 1.8           |          | 3.4           |          |                 |          | 12.5          |          |
| GASES  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Carbon dioxide   | µg/L     |                 | 130000        |          | 130000           |          | 270000        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ethane   | µg/L     |                 | < 0.94        | U        | < 0.94           | U        | < 0.47        | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ethylene   | µg/L     |                 | < 1.1         | U        | < 1.1            | U        | < 0.55        | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Methane  | µg/L     |                 | 5.4           |          | 5.5              |          | 2.5           |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Ferrous Iron   | mg/L     |                 | 0.343         |          | 0.27             |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| SULFIDE  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Sulfide  | mg/L     |                 | < 1           | U        | < 1              | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 | 55            |          | 58               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| Total organic carbon   | mg/L     |                 | 2.86          |          | 3.19             |          | 2.09          |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| VOLATILES  |          |                 |               |          |                  |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | 0.25          | UJ       | < 0.25        | 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  | µg/L     | 200             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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  | µg/L     | 14              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.2         | U        | 0.2           | UJ       | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4         | U        | < 0.4           | U        | < 0.4         | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                 |          |               |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | 12            |          | 12               |          | 7.5           |          | 0.39          | J        | 3.6           |          | 3.97          |          | 4.59          |          | 3.03          |          | 3.93          |          | 2.93          |          | 2.92            |          | 1.56          |          |
| 1,1-Dichloroethene   | µg/L     | 7               | 160           |          | 160              |          | 110           |          | < 0.5         | U        | 16.1          |          | 17.5          |          | 20.8          |          | 8.93          |          | 11.6          |          | 8.17          |          | 8.29            |          | 2.71          |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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   | µg/L     | 310             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.15        | U        | < 0.15        | 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   | µg/L     | 0.041           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1             | U        | < 1           | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.2         | U        | < 0.2         | 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   | µg/L     | 5,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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  | µg/L     | 0               | < 1           | U        | < 1              | U        | < 0.5         | U        | 1             | UJ       | 1             | UJ       | < 2           | U        | 2             | UJ       | < 2           | U        | < 2           | U        | < 2           | U        | < 2             | U        | < 2           | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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  | µg/L     | 600             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.125       | U        | < 0.125       | 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   | µg/L     | 5               | 6.5           |          | 6.2              |          | 5.1           |          | < 0.25        | U        | < 0.25        | U        | 0.414         | J        | 0.347         | J        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        |
| 1,2-Dichloropropane  | µg/L     | 5               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.2         | U        | < 0.2         | 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   | µg/L     | 5,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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  | µg/L     | 3,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | 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  | µg/L     | 29              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.2         | U        | < 0.2         | 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  | µg/L     | 75              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.125       | U        | < 0.125       | 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  | µg/L     | 42              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.25        | U        | < 0.25        | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 0.5           | U        | < 0.5         | U        |
| 2-Butanone   | µg/L     | 61,000          | < 1           | U        | < 1              | U        | < 1           | U        | < 2.5         | U        | < 2.5         | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5             | U        | < 5           | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        | < 0.125       | U        | < 0.125       | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.25        | U        | < 0.25          | U        | 0.25          | UJ       |













| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW10        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|--|
|  |          |                 | 67WW10-092713 |          | 67WW10-012414 |          | 67WW10-050614 |          | 67WW10-072414 |          | 67WW10-120314 |          | 67WW10-021015 |          | 67WW10-051215 |          | 67WW10-111815 |          | 67WW10-051816 |          | 67WW10-112917 |          | 67WW10-180503 |          | 67WW10-181022 |          |  |
|  |          |                 | 9/27/2013     |          | 1/24/2014     |          | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 11/18/2015    |          | 5/18/2016     |          | 11/29/2017    |          | 5/3/2018      |          | 10/22/2018    |          |  |
|  |          |                 | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 25.35 - 25.6  |          | 23.83 - 23.93 |          | 25.65 - 25.88 |          |  |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          |  |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |  |
| <b>ANIONS</b>  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| DHC  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| BVC  | CEQ/mL   |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| <b>FIELD TESTS</b>   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Conductivity   | µS/cm    |                 | 6.23          |          | 6.45          |          | 6.02          |          | 6.13          |          | 6.09          |          | 5.84          |          | 5.65          |          | 5.95          |          | 6.36          |          | 5.12          |          | 5.44          |          | 5.17          |          |  |
| Dissolved oxygen   | mg/L     |                 | 0.6           |          | 0.54          |          | 0.44          |          | 0.52          |          | 0             |          | 0             |          | 0.64          |          | 0.1           |          | 0.5           |          | 0.32          |          | 1.16          |          | 0.18          |          |  |
| Oxidation-Reduction Potential  | mV       |                 | -9            |          | 29            |          | 55            |          | 174           |          | 83            |          | 25            |          | 117           |          | 68            |          | 163           |          | 221           |          | 192           |          | 178           |          |  |
| pH   | SU       |                 | 6.02          |          | 6.07          |          | 5.29          |          | 5.59          |          | 5.56          |          | 6.18          |          | 5.53          |          | 5.77          |          | 5.02          |          | 5.01          |          | 4.97          |          | 5.51          |          |  |
| Temperature  | C        |                 | 25.2          |          | 15.1          |          | 20.2          |          | 22.24         |          | 19.2          |          | 17.33         |          | 18.78         |          | 17.68         |          | 18.66         |          | 19.32         |          | 20.94         |          | 18.54         |          |  |
| Turbidity  | NTU      |                 | 1.6           |          | 0.4           |          | 2.6           |          | 54.7          |          | 9.1           |          | 0             |          | 217           |          | 90.8          |          | 30.9          |          | 42            |          | 22.3          |          | 31.2          |          |  |
| <b>GASES</b>   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| <b>GENERAL CHEMISTRY</b>   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| <b>SULFIDE</b>   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| <b>TOTAL ORGANIC CARBON</b>  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| <b>VOLATILES</b>   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 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           | U        | < 0.5         | U        | < 0.5         | U        |  |
| 1,1,1-Trichloroethane  | µg/L     | 200             |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |  |













Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW12        |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
|--|----------|-----------------|---------------|----------|------------------|----------|---------------|----------|---------------|----------|---------------|----------|------------------|----------|---------------|----------|------------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |          |                 | 67WW12-051215 |          | 67WW12FFD-111815 |          | 67WW12-111815 |          | 67WW12-161215 |          | 67WW12-161215 |          | 67WW12-161215DUP |          | 67WW12-051816 |          | 67WW12-112917-FD |          | 67WW12-112917 |          | 67WW12-180503 |          | 67WW12-181022 |          | 67WW12-190502 |          |
|  |          |                 | 5/12/2015     |          | 11/18/2015       |          | 11/18/2015    |          | 12/16/2015    |          | 12/16/2015    |          | 12/16/2015       |          | 5/18/2016     |          | 11/29/2017       |          | 11/29/2017    |          | 5/3/2018      |          | 10/22/2018    |          | 5/2/2019      |          |
|  |          |                 | 0 - 0         |          | 0 - 0            |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0            |          | 0 - 0         |          | 26.03 - 26.26    |          | 26.03 - 26.26 |          | 24.92 - 25.03 |          | 26.3 - 26.55  |          | 23.85 - 24.05 |          |
|  |          |                 | REG           |          | FD               |          | REG           |          | REG           |          | REG           |          | FD               |          | REG           |          | FD               |          | REG           |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result           | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Chloride   | mg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Nitrate  | mg/L     | 10              |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Nitrite  | mg/L     | 1               |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| DHC  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| BVC  | CEO/mL   |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| FIELD TESTS  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Conductivity   | µS/cm    |                 | 3.34          |          |                  |          | 3.69          |          |               |          | 4.66          |          |                  |          | 4.06          |          |                  |          | 5.17          |          | 4.14          |          | 5.24          |          | 3.56          |          |
| Dissolved oxygen   | mg/L     |                 | 1.23          |          |                  |          | 0.05          |          |               |          | 0             |          |                  |          | 0.36          |          |                  |          | 0.43          |          | 0             |          | 0.29          |          | 0.61          |          |
| Oxidation-Reduction Potential  | mV       |                 | 54            |          |                  |          | 178           |          |               |          | 50            |          |                  |          | 221           |          |                  |          | 209           |          | 295           |          | 209           |          | 187           |          |
| pH   | SU       |                 | 5.41          |          |                  |          | 5.21          |          |               |          | 5.85          |          |                  |          | 4.96          |          |                  |          | 5.52          |          | 5.33          |          | 5.68          |          | 5.35          |          |
| Temperature  | C        |                 | 18.55         |          |                  |          | 17.95         |          |               |          | 19.38         |          |                  |          | 18.41         |          |                  |          | 19.71         |          | 20.76         |          | 18.77         |          | 20.12         |          |
| Turbidity  | NTU      |                 | 0             |          |                  |          | 3.1           |          |               |          | 11            |          |                  |          | 5.7           |          |                  |          | 0             |          | 0             |          | 0             |          | 6.3           |          |
| GASES  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Ethane   | µg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Ethylene   | µg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Methane  | µg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| SULFIDE  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Sulfide  | mg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| VOLATILES  |          |                 |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          |                  |          |               |          |               |          |               |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 0.4         | U        | < 0.4            | U        | < 0.4         | U        |               |          |               |          |                  |          | < 0.4         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |               |          |                  |          |               |          |               |          |               |          |                  |          |               |          | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | < 0.25        | U        | < 0.25           | U        | < 0.25        | U        |               |          |               |          |                  |          | < 0.25        | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | < 1           | U        | < 1              | U        | < 1           | U        |               |          |               |          |                  |          | 0.681         | J        | 1.8              |          | 2.2           |          | < 0.5         | U        | 4.8           |          | 2.1           |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 0.3         | U        | < 0.3            | U        | < 0.3         | U        |               |          |               |          |                  |          | < 0.3         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 1           | U        | < 1              | U        | < 1           | U        |               |          |               |          |                  |          | < 1           | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.4         | U        | < 0.4            | U        | < 0.4         | U        |               |          |               |          |                  |          | < 0.4         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 2           | U        | < 2              | U        | < 2           | U        |               |          |               |          |                  |          | < 2           | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 0.25        | U        | < 0.25           | U        | < 0.25        | U        |               |          |               |          |                  |          | < 0.25        | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,2-Dichloropropane  | µg/L     | 5               | < 0.4         | U        | < 0.4            | U        | < 0.4         | U        |               |          |               |          |                  |          | < 0.4         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 0.4         | U        | < 0.4            | U        | < 0.4         | U        |               |          |               |          |                  |          | < 0.4         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 0.25        | U        | < 0.25           | U        | < 0.25        | U        |               |          |               |          |                  |          | < 0.25        | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 0.5         | U        | < 0.5            | U        | < 0.5         | U        |               |          |               |          |                  |          | < 0.5         | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |
| 2-Butanone   | µg/L     | 61,000          | < 5           | U        | < 5              | U        | < 5           | U        |               |          |               |          |                  |          | < 5           | U        | < 2              | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.25        | U        | < 0.25           | U        | < 0.25        | U        |               |          |               |          |                  |          | < 0.25        | U        | < 1              | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        |

Table 2-4  
Groundwater Results 2013-2019

| Location Code             |       | 67WW12          |        |               |        |                  |        |               |        |               |        |               |        |                  |        |               |        |                  |        |               |        |               |        |               |        |               |  |
|---------------------------|-------|-----------------|--------|---------------|--------|------------------|--------|---------------|--------|---------------|--------|---------------|--------|------------------|--------|---------------|--------|------------------|--------|---------------|--------|---------------|--------|---------------|--------|---------------|--|
|                           |       | Sample ID       |        | 67WW12-051215 |        | 67WW12FFD-111815 |        | 67WW12-111815 |        | 67WW12-161215 |        | 67WW12-161215 |        | 67WW12-161215DUP |        | 67WW12-051816 |        | 67WW12-112917-FD |        | 67WW12-112917 |        | 67WW12-180503 |        | 67WW12-181022 |        | 67WW12-190502 |  |
|                           |       | Sample Date     |        | 5/12/2015     |        | 11/18/2015       |        | 11/18/2015    |        | 12/16/2015    |        | 12/16/2015    |        | 12/16/2015       |        | 5/18/2016     |        | 11/29/2017       |        | 11/29/2017    |        | 5/3/2018      |        | 10/22/2018    |        | 5/2/2019      |  |
|                           |       | Depth           |        | 0 - 0         |        | 0 - 0            |        | 0 - 0         |        | 0 - 0         |        | 0 - 0         |        | 0 - 0            |        | 0 - 0         |        | 26.03 - 26.26    |        | 26.03 - 26.26 |        | 24.92 - 25.03 |        | 26.3 - 26.55  |        | 23.85 - 24.05 |  |
|                           |       | Sample Purpose  |        | REG           |        | FD               |        | REG           |        | REG           |        | REG           |        | FD               |        | REG           |        | FD               |        | REG           |        | REG           |        | REG           |        | REG           |  |
| Parameter                 | Units | MCL /<br>GW-Ind | Result | Val Qual      | Result | Val Qual         | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual         | Result | Val Qual      | Result | Val Qual         | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      | Result | Val Qual      |  |
| 2-Hexanone                | µg/L  | 6,100           | 5      | UJ            | < 5    | U                | < 5    | U             |        |               |        |               |        |                  | < 5    | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 1    | U             | < 1    | U             |  |
| 4-Chlorotoluene           | µg/L  | 2,000           | < 0.5  | U             | < 0.5  | U                | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Acetone                   | µg/L  | 92,000          | < 5    | U             | < 5    | U                | < 5    | U             |        |               |        |               |        |                  | < 5    | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 2    | U             | < 1    | U             |  |
| Benzene                   | µg/L  | 5               | < 0.25 | U             | < 0.25 | U                | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Bromobenzene              | µg/L  | 2,000           | < 0.25 | U             | < 0.25 | U                | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Bromochloromethane        | µg/L  | 4,100           | < 0.4  | U             | < 0.4  | U                | < 0.4  | U             |        |               |        |               |        |                  | < 0.4  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Bromodichloromethane      | µg/L  | 4.6             | < 0.5  | U             | < 0.5  | U                | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Bromoform                 | µg/L  | 36              | < 1    | U             | < 1    | U                | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Bromomethane              | µg/L  | 140             | < 1    | U             | < 1    | U                | < 1    | U             |        |               |        |               |        |                  | 1      | UJ            | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Carbon disulfide          | µg/L  | 10,000          | < 1    | U             |        |                  | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 1    | U             | < 1    | U             |  |
| Carbon tetrachloride      | µg/L  | 5               | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Chlorobenzene             | µg/L  | 100             | < 0.25 | U             |        |                  | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Chloroethane              | µg/L  | 41,000          | < 1    | U             |        |                  | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Chloroform                | µg/L  | 1,000           | < 0.25 | U             |        |                  | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Chloromethane             | µg/L  | 220             | < 1    | U             |        |                  | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| cis-1,2-Dichloroethene    | µg/L  | 70              | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| cis-1,3-Dichloropropene   | µg/L  | 5.3             | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Dibromochloromethane      | µg/L  | 34              | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Dibromomethane            | µg/L  | 380             | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Dichlorodifluoromethane   | µg/L  | 20,000          | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | UJ            | < 0.5  | U             |  |
| Ethylbenzene              | µg/L  | 700             | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Hexachlorobutadiene       | µg/L  | 20              | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 1    | U             | < 1    | U             |  |
| Isopropylbenzene          | µg/L  | 10,000          | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| m,p-Xylenes               | µg/L  | 10,000          | < 1    | U             |        |                  | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 1    | U             | < 1    | U             |  |
| Methyl isobutyl ketone    | µg/L  | 8,200           | < 5    | U             | < 5    | U                | < 5    | U             |        |               |        |               |        |                  | < 5    | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 1    | U             | < 1    | U             |  |
| Methylene chloride        | µg/L  | 5               | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 2    | U                | < 2    | U             | < 1    | U             | < 1    | U             | < 1    | U             |  |
| Naphthalene               | µg/L  | 2,000           | < 0.4  | U             |        |                  | < 0.4  | U             |        |               |        |               |        |                  | < 0.4  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| n-Butylbenzene            | µg/L  | 4,100           | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| n-Propylbenzene           | µg/L  | 4,100           | < 0.25 | U             |        |                  | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| o-Xylene                  | µg/L  | 10,000          | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| p-Isopropyltoluene        | µg/L  | 10,000          | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| sec-Butylbenzene          | µg/L  | 4,100           | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Styrene                   | µg/L  | 100             | < 0.25 | U             |        |                  | < 0.25 | U             |        |               |        |               |        |                  | < 0.25 | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| tert-Butylbenzene         | µg/L  | 4,100           | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Tetrachloroethene         | µg/L  | 5               | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Toluene                   | µg/L  | 1,000           | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| trans-1,2-Dichloroethene  | µg/L  | 100             | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| trans-1,3-Dichloropropene | µg/L  | 29              | < 1    | U             |        |                  | < 1    | U             |        |               |        |               |        |                  | < 1    | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Trichloroethene           | µg/L  | 5               | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Trichlorofluoromethane    | µg/L  | 31,000          | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |
| Vinyl chloride            | µg/L  | 2               | < 0.5  | U             |        |                  | < 0.5  | U             |        |               |        |               |        |                  | < 0.5  | U             | < 1    | U                | < 1    | U             | < 0.5  | U             | < 0.5  | U             | < 0.5  | U             |  |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW13        |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|-----------------|----------|-----------------|----------|---------------|----------|-----------------|----------|---------------|----------|-----------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |          |                 | 67WW13-053113 |          | 67WW13-100113 |          | 67WW13-012414 |          | 67WW13FD-012414 |          | 67WW13FD-050614 |          | 67WW13-050614 |          | 67WW13FD-072514 |          | 67WW13-072514 |          | 67WW13FD-120414 |          | 67WW13-120414 |          | 67WW13-021115 |          | 67WW13-032515 |          |
|  |          |                 | 5/31/2013     |          | 10/1/2013     |          | 1/24/2014     |          | 1/24/2014       |          | 5/6/2014        |          | 5/6/2014      |          | 7/25/2014       |          | 7/25/2014     |          | 12/4/2014       |          | 12/4/2014     |          | 2/11/2015     |          | 3/25/2015     |          |
|  |          |                 | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0           |          | 0 - 0           |          | 0 - 0         |          | 0 - 0           |          | 0 - 0         |          | 0 - 0           |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | FD              |          | FD              |          | REG           |          | FD              |          | REG           |          | FD              |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result          | Val Qual | Result          | Val Qual | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual | Result          | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | 1820          |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 2           | U        |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 2           | U        |
| DHC  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Conductivity   | µS/cm    |                 | 5.55          |          | 6.65          |          | 6.87          |          |                 |          |                 |          | 6.16          |          |                 |          | 6.83          |          |                 |          | 6.81          |          | 6.08          |          | 6.54          |          |
| Dissolved oxygen   | mg/L     |                 | 1.17          |          | 0.98          |          | 0.16          |          |                 |          |                 |          | 2.03          |          |                 |          | 1.19          |          |                 |          | 0.29          |          | 1.73          |          | 1.55          |          |
| Oxidation-Reduction Potential  | mV       |                 | 106           |          | 37            |          | 125           |          |                 |          |                 |          | 122           |          |                 |          | 178           |          |                 |          | 150           |          | 145           |          | 176           |          |
| pH   | SU       |                 | 6.68          |          | 7.09          |          | 6.76          |          |                 |          |                 |          | 5.86          |          |                 |          | 6.24          |          |                 |          | 6.46          |          | 7.16          |          | 4.62          |          |
| Temperature  | C        |                 | 34.55         |          | 21.97         |          | 15.8          |          |                 |          |                 |          | 25.17         |          |                 |          | 25.2          |          |                 |          | 19.85         |          | 16.69         |          | 20.67         |          |
| Turbidity  | NTU      |                 | 0.2           |          | 0.3           |          | 0             |          |                 |          |                 |          | 1.2           |          |                 |          | 0.2           |          |                 |          | 0             |          | 0.2           |          | 0             |          |
| GASES  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 2           | U        |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 2           | U        |
| Methane  | µg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 2           | U        |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 40          | U        |
| SULFIDE  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | < 1           | U        |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          | 16.8          | J        |
| VOLATILES  |          |                 |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.25        | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 0.25        | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 0.2         | U        | < 0.4         | U        | < 1           | U        | < 1             | U        | < 0.8           | U        | < 0.8         | U        | < 0.4           | U        | < 0.4         | U        | < 2             | U        | < 2           | U        | < 1           | U        |               |          |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |               |          |               |          |               |          |                 |          |                 |          |               |          |                 |          |               |          |                 |          |               |          |               |          |               |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | 3.58          |          | 3.37          |          | 2.99          |          | 3.01            |          | 1.95            | J        | 1.99          | J        | 3.56            |          | 3.48          |          | 4.56            | J        | 4.4           | J        | 4.87          |          |               |          |
| 1,1-Dichloroethane   | µg/L     | 10,000          | 35.5          |          | 33.8          |          | 32.7          |          | 32.4            |          | 14.4            |          | 15.5          |          | 22.1            |          | 21.9          |          | 27.4            |          | 28.8          |          | 29.1          |          |               |          |
| 1,1-Dichloroethene   | µg/L     | 7               | 498           |          | 515           |          | 572           |          | 569             |          | 228             |          | 240           |          | 362             |          | 353           |          | 522             |          | 572           |          | 521           |          |               |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 2.5         | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 1.5         | U        | < 0.3         | U        | < 0.75        | U        | < 0.75          | U        | < 0.6           | U        | < 0.6         | U        | < 0.3           | U        | < 0.3         | U        | < 1.5           | U        | < 1.5         | U        | < 0.75        | U        |               |          |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 5           | U        | < 1           | U        | < 2.5         | U        | < 2.5           | U        | < 2             | U        | < 2           | U        | < 1             | U        | < 1           | U        | < 5             | U        | < 5           | U        | < 2.5         | U        |               |          |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.2         | U        | < 0.4         | U        | < 1           | U        | < 1             | U        | < 0.8           | U        | < 0.8         | U        | < 0.4           | U        | < 0.4         | U        | < 2             | U        | < 2           | U        | < 1           | U        |               |          |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 2.5         | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 10          | U        | 2             | UJ       | < 5           | U        | 5               | UJ       | < 4             | U        | < 4           | U        | < 2             | U        | < 2           | U        | < 10            | U        | < 10          | U        | < 5           | U        |               |          |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.25        | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 0.125       | U        | < 0.25        | U        | < 0.626       | U        | < 0.626         | U        | < 0.5           | U        | < 0.5         | U        | < 0.25          | U        | < 0.25        | U        | < 1.25          | U        | < 1.25        | U        | < 0.626       | U        |               |          |
| 1,2-Dichloroethane   | µg/L     | 5               | 23.1          |          | 23.8          |          | 22.9          |          | 22.9            |          | 12.9            |          | 13.7          |          | 20.1            |          | 19.8          |          | 24.6            |          | 24.9          |          | 26            |          |               |          |
| 1,2-Dichloropropane  | µg/L     | 5               | < 2           | U        | < 0.4         | U        | < 1           | U        | < 1             | U        | < 0.8           | U        | < 0.8         | U        | < 0.4           | U        | < 0.4         | U        | < 2             | U        | < 2           | U        | < 1           | U        |               |          |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 2.5         | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 2.5         | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | < 1             | U        | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 1,3-Dichloropropane  | µg/L     | 29              | < 2           | U        | < 0.4         | U        | < 1           | U        | < 1             | U        | < 0.8           | U        | < 0.8         | U        | < 0.4           | U        | < 0.4         | U        | < 2             | U        | < 2           | U        | < 1           | U        |               |          |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 1.25        | U        | < 0.25        | U        | < 0.626       | U        | < 0.626         | U        | < 0.5           | U        | < 0.5         | U        | < 0.25          | U        | < 0.25        | U        | < 1.25          | U        | < 1.25        | U        | < 0.626       | U        |               |          |
| 2,2-Dichloropropane  | µg/L     | 42              | < 2.5         | U        | < 0.5         | U        | < 1.25        | U        | < 1.25          | U        | 1               | UJ       | < 1           | U        | < 0.5           | U        | < 0.5         | U        | < 2.5           | U        | < 2.5         | U        | < 1.25        | U        |               |          |
| 2-Butanone   | µg/L     | 61,000          | < 2.5         | U        | < 5           | U        | < 12.5        | U        | < 12.5          | U        | < 10            | U        | < 10          | U        | < 5             | U        | < 5           | U        | < 25            | U        | < 25          | U        | < 12.5        | U        |               |          |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.125       | U        | < 0.25        | U        | < 0.626       | U        | < 0.626         | U        | < 0.5           | U        | < 0.5         | U        | < 0.25          | U        | < 0.25        | U        | < 1.25          | U        | < 1.25        | U        | < 0.626       | U        |               |          |









Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW14        |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------------|----------|-----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|  |          |                 | 67WW14-012414 |          | 67WW14-050714 |          | 67WW14-072514 |          | 67WW14-120314 |          | 67WW14-021015 |          | 67WW14FD-021015 |          | 67WW14FD-051215 |          | 67WW14-051215 |          | 67WW14-111815 |          | 67WW14-051816 |          | 67WW14-112717 |          | 67WW14-180502 |          |
|  |          |                 | 1/24/2014     |          | 5/7/2014      |          | 7/25/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 2/10/2015       |          | 5/12/2015       |          | 5/12/2015     |          | 11/18/2015    |          | 5/18/2016     |          | 11/27/2017    |          | 5/2/2018      |          |
|  |          |                 | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 0 - 0           |          | 0 - 0           |          | 0 - 0         |          | 0 - 0         |          | 0 - 0         |          | 20.51 - 20.75 |          | 19.98 - 20.15 |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | FD              |          | FD              |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result          | Val Qual | Result          | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| DHC  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Conductivity   | µS/cm    |                 | 1.53          |          | 1.68          |          | 1.66          |          | 1.52          |          | 1.51          |          |                 |          |                 |          | 1.47          |          | 2.25          |          | 0.021         |          | 2.09          |          | 1.99          |          |
| Dissolved oxygen   | mg/L     |                 | 0.67          |          | 1.17          |          | 0.12          |          | 0             |          | 0.63          |          |                 |          |                 |          | 0.68          |          | 0.52          |          | 1.04          |          | 1.17          |          | 0.19          |          |
| Oxidation-Reduction Potential  | mV       |                 | -37           |          | -5            |          | 210           |          | -8            |          | -13           |          |                 |          |                 |          | 158           |          | 136           |          | 252           |          | 250           |          | 392           |          |
| pH   | SU       |                 | 6.52          |          | 5.67          |          | 5.34          |          | 6.34          |          | 6.79          |          |                 |          |                 |          | 5.57          |          | 6.58          |          | 5.36          |          | 5.85          |          | 5.90          |          |
| Temperature  | C        |                 | 18.42         |          | 19.86         |          | 25.56         |          | 20.74         |          | 15.24         |          |                 |          |                 |          | 20.48         |          | 21.67         |          | 19.84         |          | 19.19         |          | 21.65         |          |
| Turbidity  | NTU      |                 | 15.5          |          | 24.8          |          | 17.3          |          | 8.1           |          | 7             |          |                 |          |                 |          | 161           |          | 6.5           |          | 172           |          | 20.7          |          | 7.4           |          |
| GASES  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| SULFIDE  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| VOLATILES  |          |                 |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               |          |               |          |               |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 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        | < 0.4         | U        | < 1           | U        | < 0.5         | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       |               |          |               |          |               |          |               |          |               |          |                 |          |                 |          |               |          |               |          |               | < 1      | U             | < 0.5    | U             |          |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | 0.275         | J        | 0.538         | J        | 0.58          | J        | 0.451         | J        | 0.434         | J        | 0.369           | J        | 0.427           | J        | 0.418         | J        | 3.7           |          | 2.15          |          | < 1           | U        | < 0.5         | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | 2.58          |          | 4.27          |          | 3.57          |          | 4.73          |          | 3.46          |          | 3.61            |          | 2.93            |          | 2.77          |          | 26.3          |          | 10.8          |          | 5.6           |          | 4.2           |          |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 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        | < 0.3         | U        | < 1           | U        | < 0.5         | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1             | U        | < 1             | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 0.5         | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 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        | < 0.4         | U        | < 1           | U        | < 0.5         | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 2             | U        | < 2             | U        | < 2           | U        | < 2           | U        | < 2           | U        | < 1           | U        | < 0.5         | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 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        | < 0.25        | U        | < 1           | U        | < 0.5         | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | 0.666         | J        | 0.897         | J        | 1.31          |          | 0.79          | J        | 0.64          | J        | 0.657           | J        | 0.815           | J        | 0.799         | J        | 5.83          |          | 3.54          |          | 3.1           |          | 1.9           |          |
| 1,2-Dichloropropane  | µg/L     | 5               | < 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        | < 0.4         | U        | < 1           | U        | < 0.5         | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 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        | < 0.4         | U        | < 1           | U        | < 0.5         | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 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        | < 0.25        | U        | < 1           | U        | < 0.5         | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 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        | < 0.5         | U        | < 1           | U        | < 0.5         | U        |
| 2-Butanone   | µg/L     | 61,000          | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5           | U        | < 5             | U        | 5               | UJ       | 5             | UJ       | < 5           | U        | < 5           | U        | < 2           | U        | < 1           | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 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        | < 0.25        | U        | < 1           | U        | < 0.5         | U        |



Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |          |                 | 67WW14        |          |               |          | 67WW15        |          |               |          |               |          |               |          | 67WW16I       |          |                |          |                |          |                |          |                |          |
|--|----------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|
|  |          |                 | 67WW14-181022 |          | 67WW14-190502 |          | 67WW15-051916 |          | 67WW15-112717 |          | 67WW15-180502 |          | 67WW15-181023 |          | 67WW15-190503 |          | 67WW16I-112917 |          | 67WW16I-180503 |          | 67WW16I-181025 |          | 67WW16I-190501 |          |
|  |          |                 | 10/22/2018    |          | 5/2/2019      |          | 5/19/2016     |          | 11/27/2017    |          | 5/2/2018      |          | 10/23/2018    |          | 5/3/2019      |          | 11/29/2017     |          | 5/3/2018       |          | 10/25/2018     |          | 5/1/2019       |          |
|  |          |                 | 20.85 - 21.08 |          | 18.78 - 19.02 |          | 0 - 0         |          | 23.85 - 24.09 |          | 23.08 - 23.23 |          | 24.23 - 24.44 |          | 22.04 - 22.23 |          | 24.81 - 25     |          | 22.8 - 22.91   |          | 24.03 - 24.22  |          | 21.8 - 21.98   |          |
|  |          |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG            |          | REG            |          | REG            |          | REG            |          |
| Parameter  | Units    | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual |
| ANIONS   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Chloride   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Nitrate  | mg/L     | 10              |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Nitrite  | mg/L     | 1               |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| DHC  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| BVC  | CEO/mL   |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Dehalococcoides  | cells/mL |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| FIELD TESTS  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Conductivity   | µS/cm    |                 | 2.09          |          | 2.17          |          | 2.45          |          | 1.52          |          | 1.46          |          | 1.8           |          | 1.93          |          | 1.43           |          | 1              |          | 1.53           |          | 1.50           |          |
| Dissolved oxygen   | mg/L     |                 | 0.66          |          | 0.27          |          | 1.5           |          | 2.16          |          | 1.39          |          | 0.16          |          | 2.85          |          | 0.41           |          | 0              |          | 0.14           |          | 1.63           |          |
| Oxidation-Reduction Potential  | mV       |                 | 274           |          | 228           |          | 228           |          | 289           |          | 403           |          | 253           |          | 231           |          | -2             |          | 85             |          | 41             |          | 18             |          |
| pH   | SU       |                 | 5.76          |          | 5.89          |          | 5.58          |          | 5.27          |          | 5.29          |          | 5.61          |          | 5.43          |          | 6.26           |          | 6.14           |          | 6.24           |          | 5.35           |          |
| Temperature  | C        |                 | 21.68         |          | 20.83         |          | 18.7          |          | 18.27         |          | 19.62         |          | 18.06         |          | 20.33         |          | 19.76          |          | 19.73          |          | 17.69          |          | 22.48          |          |
| Turbidity  | NTU      |                 | 0             |          | 30.6          |          | 6.8           |          | 55.9          |          | 12.6          |          | 2.1           |          | 0             |          | 6.3            |          | 4.3            |          | 7.6            |          | 1.9            |          |
| GASES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Carbon dioxide   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Ethane   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Ethylene   | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Methane  | µg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| GENERAL CHEMISTRY  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Ferrous Iron   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| SULFIDE  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Sulfide  | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| TOTAL ORGANIC CARBON   |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Total Inorganic Carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| Total organic carbon   | mg/L     |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| VOLATILES  |          |                 |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |                |          |                |          |                |          |
| 1,1,1,2-Tetrachloroethane  | µg/L     | 110             | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,1-Trichloroethane  | µg/L     | 200             | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,2,2-Tetrachloroethane  | µg/L     | 14              | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,2-Trichloro-1,2,2-Trifluoroethane                                | µg/L     | 3,100,000       | < 0.5         | U        | < 0.5         | U        |               |          | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1,2-Trichloroethane  | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        | 22.7          |          | 5.6           |          | 5.6           |          | 6             |          | 5.4           |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1-Dichloroethane   | µg/L     | 10,000          | 1.3           |          | 1.4           |          | 57.3          |          | 11            |          | 10            |          | 13            |          | 9.2           |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1-Dichloroethene   | µg/L     | 7               | 6.6           |          | 5.3           |          | 2460          |          | 510           |          | 380           |          | 670           |          | 330           |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,1-Dichloropropene  | µg/L     | 2.9             | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2,3-Trichlorobenzene   | µg/L     | 310             | < 0.5         | U        | < 0.5         | U        | < 0.3         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | UJ       | < 0.5          | U        |
| 1,2,3-Trichloropropane   | µg/L     | 0.041           | < 0.5         | U        | < 0.5         | U        | < 20          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2,4-Trichlorobenzene   | µg/L     | 70              | < 0.5         | U        | < 0.5         | U        | < 8           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2,4-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2-Dibromo-3-chloropropane  | µg/L     | 0               | < 1           | U        | < 0.5         | U        | < 2           | U        | < 1           | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 1            | U        | < 0.5          | U        |
| 1,2-Dibromoethane  | µg/L     | 0               | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2-Dichlorobenzene  | µg/L     | 600             | < 0.5         | U        | < 0.5         | U        | < 5           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2-Dichloroethane   | µg/L     | 5               | 2.5           |          | 1.8           |          | 117           |          | 27            |          | 26            |          | 30            |          | 22            |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,2-Dichloropropane  | µg/L     | 5               | < 0.5         | U        | < 0.5         | U        | < 8           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,3,5-Trimethylbenzene   | µg/L     | 5,100           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,3-Dichlorobenzene  | µg/L     | 3,100           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,3-Dichloropropane  | µg/L     | 29              | < 0.5         | U        | < 0.5         | U        | < 8           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 1,4-Dichlorobenzene  | µg/L     | 75              | < 0.5         | U        | < 0.5         | U        | 0.173         | J        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 2,2-Dichloropropane  | µg/L     | 42              | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| 2-Butanone   | µg/L     | 61,000          | < 1           | U        | < 1           | U        | < 100         | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | < 1            | U        |
| 2-Chlorotoluene  | µg/L     | 2,000           | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |

Table 2-4  
Groundwater Results 2013-2019

| Location Code<br>Sample ID<br>Sample Date<br>Depth<br>Sample Purpose |       |                 | 67WW14        |          |               |          | 67WW15        |          |               |          |               |          |               |          | 67WW16I       |          |                |          |                |          |                |          |                |          |
|--|-------|-----------------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|
|  |       |                 | 67WW14-181022 |          | 67WW14-190502 |          | 67WW15-051916 |          | 67WW15-112717 |          | 67WW15-180502 |          | 67WW15-181023 |          | 67WW15-190503 |          | 67WW16I-112917 |          | 67WW16I-180503 |          | 67WW16I-181025 |          | 67WW16I-190501 |          |
|  |       |                 | 10/22/2018    |          | 5/2/2019      |          | 5/19/2016     |          | 11/27/2017    |          | 5/2/2018      |          | 10/23/2018    |          | 5/3/2019      |          | 11/29/2017     |          | 5/3/2018       |          | 10/25/2018     |          | 5/1/2019       |          |
|  |       |                 | 20.85 - 21.08 |          | 18.78 - 19.02 |          | 0 - 0         |          | 23.85 - 24.09 |          | 23.08 - 23.23 |          | 24.23 - 24.44 |          | 22.04 - 22.23 |          | 24.81 - 25     |          | 22.8 - 22.91   |          | 24.03 - 24.22  |          | 21.8 - 21.98   |          |
|  |       |                 | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG           |          | REG            |          | REG            |          | REG            |          | REG            |          |
| Parameter  | Units | MCL /<br>GW-Ind | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual |
| 2-Hexanone   | µg/L  | 6,100           | < 1           | U        | < 1           | U        | < 5           | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | < 1            | U        |
| 4-Chlorotoluene  | µg/L  | 2,000           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Acetone  | µg/L  | 92,000          | < 2           | U        | < 6.3         | U        | < 5           | U        | < 2           | U        | < 1           | U        | < 2           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 2            | U        | 3.3            |          |
| Benzene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        | 0.145         | J        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Bromobenzene   | µg/L  | 2,000           | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Bromochloromethane   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Bromodichloromethane   | µg/L  | 4.6             | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Bromoform  | µg/L  | 36              | < 0.5         | U        | < 0.5         | U        | < 20          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Bromomethane   | µg/L  | 140             | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Carbon disulfide   | µg/L  | 10,000          | < 1           | U        | < 1           | U        | < 1           | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | 0.9            | J        |
| Carbon tetrachloride   | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Chlorobenzene  | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Chloroethane   | µg/L  | 41,000          | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Chloroform   | µg/L  | 1,000           | < 0.5         | U        | < 0.5         | U        | < 5           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Chloromethane  | µg/L  | 220             | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| cis-1,2-Dichloroethene   | µg/L  | 70              | < 0.5         | U        | < 0.5         | U        | 6.1           | J        | 1.5           |          | 1.3           |          | 1.7           |          | 1.3           |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| cis-1,3-Dichloropropene  | µg/L  | 5.3             | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Dibromochloromethane   | µg/L  | 34              | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Dibromomethane   | µg/L  | 380             | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Dichlorodifluoromethane  | µg/L  | 20,000          | < 0.5         | UJ       | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | UJ       | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Ethylbenzene   | µg/L  | 700             | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Hexachlorobutadiene  | µg/L  | 20              | < 1           | U        | < 1           | U        | 0.5           | UJ       | < 1           | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 1            | U        | < 0.5          | U        | < 1            | U        | < 1            | U        |
| Isopropylbenzene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| m,p-Xylenes  | µg/L  | 10,000          | < 1           | U        | < 1           | U        | < 1           | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | < 1            | U        |
| Methyl isobutyl ketone   | µg/L  | 8,200           | < 1           | U        | < 1           | U        | < 100         | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | < 1            | U        |
| Methylene chloride   | µg/L  | 5               | < 1           | U        | < 1           | U        | < 10          | U        | < 2           | U        | < 1           | U        | < 1           | U        | < 1           | U        | < 2            | U        | < 1            | U        | < 1            | U        | < 1            | U        |
| Naphthalene  | µg/L  | 2,000           | < 0.5         | U        | < 0.5         | U        | < 0.4         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | UJ       | < 0.5          | U        |
| n-Butylbenzene   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| n-Propylbenzene  | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| o-Xylene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| p-Isopropyltoluene   | µg/L  | 10,000          | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| sec-Butylbenzene   | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Styrene  | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        | < 0.25        | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| tert-Butylbenzene  | µg/L  | 4,100           | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Tetrachloroethene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Toluene  | µg/L  | 1,000           | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| trans-1,2-Dichloroethene   | µg/L  | 100             | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| trans-1,3-Dichloropropene  | µg/L  | 29              | < 0.5         | U        | < 0.5         | U        | < 1           | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Trichloroethene  | µg/L  | 5               | < 0.5         | U        | < 0.5         | U        | 5.48          | J        | < 1           | U        | 1.2           |          | 1.4           |          | 1.1           |          | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Trichlorofluoromethane   | µg/L  | 31,000          | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |
| Vinyl chloride   | µg/L  | 2               | < 0.5         | U        | < 0.5         | U        | < 10          | U        | < 1           | U        | < 0.5         | U        | < 0.5         | U        | < 0.5         | U        | < 1            | U        | < 0.5          | U        | < 0.5          | U        | < 0.5          | U        |

Table 2-4  
2013-2019 Groundwater Results

Notes:

**Bold and highlighted results indicate analyte is above the Res-GW MCL.**

µS/cm - microsiemens per centimeter

µg/L - micrograms per liter

°C - degrees Celsius

cells/mL - cells per milliliter

CEQ/mL - cell equivalence per milliliter

*DHC - Dehalococcoides*

FD - field duplicate

GW-Ind - groundwater medium-specific concentration for industrial use

ID - identification

J - estimated value

MCL - maximum contaminant level

mg/L - milligrams per liter

mS/cm - millisiemens per centimeter

mV - millivolts

NR - not recorded

NTU - nephelometric turbidity unit

REG - regular sample

Res-GW MCL - residential groundwater MCL

SU - standard unit

U - Not detected; The analyte was analyzed for but not detected above the associated method detection limit.

Val Qual - validation qualifier

VOC - volatile organic compound

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW01        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW01-981208 |          | 67WW01-040912 |          | 67WW01-060806 |          | 67WW01-061218 |          | 67WW01-053113 |          | 67WW01-050714 |          | 67WW01-072514 |          | 67WW01-120314 |          | 67WW01-021015 |          | 67WW01-051915 |          | 67WW01-111915 |          | 67WW01-032916 |          |
|   |       |     | 12/8/1998     |          | 9/12/2004     |          | 8/6/2006      |          | 12/18/2006    |          | 5/31/2013     |          | 5/7/2014      |          | 7/25/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/19/2015     |          | 11/19/2015    |          | 3/29/2016     |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 560           |          | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1.25          | U        | 1.25          | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 33            |          | 1             | J        | 0.305         | JH       | 0.28          | J        | 0.25          | U        | 0.5           | U        | 0.29          | J        | 0.483         | J        | 1.44          |          | 1.72          | J        | 2.14          | J        | 2.67          |          |
| 1,1-Dichloroethene                        | µg/L  | 7   | 380           |          | 280           |          | 153           |          | 179           |          | 139           |          | 257           |          | 224           |          | 349           |          | 544           |          | 631           |          | 694           |          | 728           |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 27            |          | 13            |          | 5.57          | JH       | 6.37          |          | 6.68          |          | 12.2          |          | 10.7          |          | 16.6          |          | 28.7          |          | 31.4          |          | 38.6          |          | 52.6          |          |
| Trichloroethene                           | µg/L  | 5   | 6.3           |          | 6             |          | 5.38          | JH       | 5.99          |          | 2.96          |          | 3             |          | 2.3           |          | 3.36          |          | 4.07          |          | 3.03          |          | 2.84          |          | 4             |          |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

- µg/L - micrograms per liter
- H - Result may be biased high. Details are provided in the validation report.
- 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.
- ID - identification
- MCL - Maximum Contaminant Limit
- mg/L - milligrams per liter
- PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level
- ppb - parts per billion
- U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW01        |          |               |          |               |          |               |          | 67WW02        |          |           |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW01-051916 |          | 67WW01-112817 |          | 67WW01-180503 |          | 67WW01-190503 |          | 67WW02-981208 |          | 67WW02-   |          | 67WW02-040912 |          | 67WW02-060806 |          | 67WW02-061218 |          | 67WW02-053113 |          | 67WW02-092713 |          | 67WW02-012314 |          |
|   |       |     | 5/19/2016     |          | 11/28/2017    |          | 5/3/2018      |          | 5/3/2019      |          | 12/8/1998     |          | 12/8/1998 |          | 9/12/2004     |          | 8/6/2006      |          | 12/18/2006    |          | 5/31/2013     |          | 9/27/2013     |          | 1/23/2014     |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 2.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 100           |          | 100       |          | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                             | µg/L  | 5   | 1.62          | J        | 1             | U        | 1.2           |          | 1.4           |          | 6.4           |          | 5.9       | J        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 714           |          | 250           |          | 450           |          | 280           |          | 2.4           |          | 10        | U        | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 1             | U        | 1             | U        |
| 1,2-Dichloroethane                                | µg/L  | 5   | 43.3          |          | 28            |          | 22            |          | 21            |          | 1             | U        | 10        | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |
| Trichloroethene                                   | µg/L  | 5   | 3.28          | J        | 2.1           |          | 1.7           |          | 1.3           |          | 1             | U        | 10        | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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.

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

U - Undetected: The analyte was analyzed for, but not detected.



Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW02        |          |               |          |               |          |               |          |               |          |           |          |               |          |               |          |           |          |               |          |               |          |          |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|----------|----------|
|   |       |     | 67WW02-050614 |          | 67WW02-072414 |          | 67WW02-120314 |          | 67WW02-021015 |          | 67WW02-051215 |          | 67WW02FD- |          | 67WW02-111915 |          | 67WW02-051916 |          | 67WW02FD- |          | 67WW02-112817 |          | 67WW02-180503 |          | 67WW02-  |          |
|   |       |     | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 5/12/2015 |          | 11/19/2015    |          | 5/19/2016     |          | 5/19/2016 |          | 11/28/2017    |          | 5/3/2018      |          | 5/3/2018 |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result   | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 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             | U        | 0.5           | U        | 0.5      | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 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             | U        | 0.5           | U        | 0.5      | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 1             | U        | 1             | U        | 1             | U        | 3.59          |          | 13.2          |          | 13        |          | 0.857         | J        | 67.6          |          | 66.3      |          | 1             | U        | 190           |          | 190      |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        | 0.377         | J        | 0.321     | J        | 1             | U        | 2             |          | 1.9      |          |
| Trichloroethene                           | µg/L  | 5   | 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             | U        | 0.5           | U        | 0.5      | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

- µg/L - micrograms per liter
- H - Result may be biased high. Details are provided in the validation report.
- 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.
- ID - identification
- MCL - Maximum Contaminant Limit
- mg/L - milligrams per liter
- PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level
- ppb - parts per billion
- U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW02        |          |               |          | 67WW03        |          |               |          |               |          |               |          |               |          |               |          | 67WW04        |          |               |          | 67WW05        |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW02-181025 |          | 67WW02-190501 |          | 67WW03-981208 |          | 67WW03-040912 |          | 67WW03-060809 |          | 67WW03-061218 |          | 67WW03-051215 |          | 67WW03-032916 |          | 67WW03-051916 |          | 67WW04-001219 |          | 67WW04-040912 |          | 67WW05-001219 |          |
|   |       |     | 10/25/2018    |          | 5/1/2019      |          | 12/8/1998     |          | 9/12/2004     |          | 8/9/2006      |          | 12/18/2006    |          | 5/12/2015     |          | 3/29/2016     |          | 5/19/2016     |          | 12/19/2000    |          | 9/12/2004     |          | 12/19/2000    |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 0.5           | U        | 0.5           | U        | 1800          |          | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.1           | U        | 5             | U        | 0.1           | U        |
| 1,1,2-Trichloroethane                             | µg/L  | 5   | 0.5           | U        | 1.2           |          | 24            |          | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.1           | U        | 5             | U        | 0.1           | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 6.9           |          | 180           |          | 36            |          | 5             | U        | 5             | U        | 5             | U        | 1             | U        | 1             | U        | 1             | U        | 0.2           | U        | 5             | U        | 0.2           | U        |
| 1,2-Dichloroethane                                | µg/L  | 5   | 0.5           | U        | 4.7           |          | 20            | U        | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.1           | U        | 5             | U        | 0.1           | U        |
| Trichloroethene                                   | µg/L  | 5   | 0.5           | U        | 0.87          | J        | 20            | U        | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.1           | U        | 1             | J        | 0.1           | U        |

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

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MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW05        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW05-040912 |          | 67WW05-060808 |          | 67WW05-061217 |          | 67WW05-053113 |          | 67WW05-092813 |          | 67WW05-012314 |          | 67WW05-050614 |          | 67WW05-072414 |          | 67WW05-120314 |          | 67WW05-021015 |          | 67WW05-051215 |          | 67WW05-111915 |          |
|   |       |     | 9/12/2004     |          | 8/8/2006      |          | 12/17/2006    |          | 5/31/2013     |          | 9/28/2013     |          | 1/23/2014     |          | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 11/19/2015    |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 5             | U        | 5             | U        | 5             | U        | 0.25          | 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-Trichloroethane                     | µg/L  | 5   | 5             | U        | 5             | U        | 5             | U        | 0.25          | 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-Dichloroethene                        | µg/L  | 7   | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 5             | U        | 5             | U        | 5             | U        | 0.25          | 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        |
| Trichloroethene                           | µg/L  | 5   | 5             | U        | 5             | U        | 5             | U        | 0.25          | 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        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

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J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW05        |          |               |          |               |          |               |          |                |          |               |          | 67WW06        |          |            |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|---------------|----------|---------------|----------|------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW05-051916 |          | 67WW05-112817 |          | 67WW05-180503 |          | 67WW05-181025 |          | 67WW05-181025- |          | 67WW05-190502 |          | 67WW06-001219 |          | 67WW06-    |          | 67WW06-040912 |          | 67WW06-060808 |          | 67WW06-061218 |          | 67WW06-100806 |          |
|   |       |     | 5/19/2016     |          | 11/28/2017    |          | 5/3/2018      |          | 10/25/2018    |          | 10/25/2018     |          | 5/2/2019      |          | 12/19/2000    |          | 12/19/2000 |          | 9/12/2004     |          | 8/8/2006      |          | 12/18/2006    |          | 8/6/2010      |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result     | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.1           | U        | 0.1        | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.1           | U        | 0.1        | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 1             | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.2           | U        | 0.2        | U        | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5           | U        | 3.51          |          | 3.5        |          | 5             | U        | 3.02          | J        | 1.62          | J        | 2.39          |          |
| Trichloroethene                           | µg/L  | 5   | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.14          | J        | 0.15       | J        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        |

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

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ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW06        |          |                |          |               |          |               |          |               |          | 67WW07        |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW06-053113 |          | 67WW06-053113- |          | 67WW06-092813 |          | 67WW06-012414 |          | 67WW06-112917 |          | 67WW07-001219 |          | 67WW07-040912 |          | 67WW07-060808 |          | 67WW07-061218 |          | 67WW07-053113 |          | 67WW07-092713 |          | 67WW07-012314 |          |
|   |       |     | 5/31/2013     |          | 5/31/2013      |          | 9/28/2013     |          | 1/24/2014     |          | 11/29/2017    |          | 12/19/2000    |          | 9/12/2004     |          | 8/8/2006      |          | 12/18/2006    |          | 5/31/2013     |          | 9/27/2013     |          | 1/23/2014     |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.25          | U        | 0.25           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.1           | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 0.25          | U        | 0.25           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.1           | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 0.5           | U        | 0.5            | U        | 1             | U        | 0.752         | J        | 1             | U        | 0.2           | U        | 5             | U        | 5             | U        | 5             | U        | 0.5           | U        | 1             | U        | 1             | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 2.25          |          | 2.2            |          | 1.77          |          | 2.03          |          | 1             |          | 2.28          |          | 5             | U        | 5             | U        | 1.65          | J        | 1.67          |          | 1.77          |          | 1.35          |          |
| Trichloroethene                           | µg/L  | 5   | 0.25          | U        | 0.25           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.1           | U        | 5             | U        | 5             | U        | 5             | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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.

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW07        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          | 67WW08        |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW07-050614 |          | 67WW07-072514 |          | 67WW07-120314 |          | 67WW07-021015 |          | 67WW07-051215 |          | 67WW07-111915 |          | 67WW07-051916 |          | 67WW07-112917 |          | 67WW07-180503 |          | 67WW07-181025 |          | 67WW07-190503 |          | 67WW08-060313 |          |
|   |       |     | 5/6/2014      |          | 7/25/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 11/19/2015    |          | 5/19/2016     |          | 11/29/2017    |          | 5/3/2018      |          | 10/25/2018    |          | 5/3/2019      |          | 6/3/2013      |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 4.25          |          |
| 1,1-Dichloroethene                        | µg/L  | 7   | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1390          | J        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 1.44          |          | 1.39          |          | 1.19          |          | 1.04          |          | 0.817         | J        | 0.601         | J        | 0.33          | J        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 64.3          | R        |
| Trichloroethene                           | µg/L  | 5   | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 2.86          |          |

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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.

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW08        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |                |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|---------------|----------|
|   |       |     | 67WW08-100213 |          | 67WW08-012314 |          | 67WW08-050714 |          | 67WW08-072414 |          | 67WW08-120414 |          | 67WW08-021115 |          | 67WW08-051915 |          | 67WW08-111915 |          | 67WW08-051916 |          | 67WW08-112817 |          | 67WW08-112817- |          | 67WW08-180501 |          |
|   |       |     | 10/2/2013     |          | 1/23/2014     |          | 5/7/2014      |          | 7/24/2014     |          | 12/4/2014     |          | 2/11/2015     |          | 5/19/2015     |          | 11/19/2015    |          | 5/19/2016     |          | 11/28/2017    |          | 11/28/2017     |          | 5/1/2018      |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 5             | U        | 2.5           | U        | 5             | U        | 5             | U        | 5             | U        | 5             | U        | 5             | U        | 5             | U        | 5             | U        | 1             | U        | 1              | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 5.08          | J        | 6.7           |          | 5.01          | J        | 7.74          | J        | 7.36          | J        | 6.96          | J        | 4.5           | J        | 4.67          | J        | 2.76          | J        | 1             | U        | 1              | U        | 0.5           | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 1120          |          | 1340          |          | 1590          |          | 1890          |          | 2320          |          | 1930          |          | 1570          |          | 1710          |          | 1130          |          | 340           |          | 350            |          | 300           |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 76.5          |          | 89.9          |          | 101           |          | 98.9          |          | 106           |          | 104           |          | 85.6          |          | 77.6          |          | 56.1          |          | 13            |          | 13             |          | 11            |          |
| Trichloroethene                           | µg/L  | 5   | 5             | U        | 3.12          | J        | 4.41          | J        | 3.14          | J        | 3.55          | J        | 3.15          | J        | 5             | U        | 5             | U        | 5             | U        | 1             | U        | 1              | U        | 0.5           | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

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MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW08        |          |                |          |               |          | 67WW09        |          |               |          |               |          |               |          |               |          |               |          |               |          |           |          |               |          |
|---|-------|-----|---------------|----------|----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|-----------|----------|---------------|----------|
|   |       |     | 67WW08-181023 |          | 67WW08-181023- |          | 67WW08-190501 |          | 67WW10-060113 |          | 67WW09-060113 |          | 67WW09-092813 |          | 67WW09-012414 |          | 67WW09-072514 |          | 67WW09-120414 |          | 67WW09-021115 |          | 67WW09FD- |          | 67WW09-051915 |          |
|   |       |     | 10/23/2018    |          | 10/23/2018     |          | 5/1/2019      |          | 6/1/2013      |          | 6/3/2013      |          | 9/28/2013     |          | 1/24/2014     |          | 7/25/2014     |          | 12/4/2014     |          | 2/11/2015     |          | 2/11/2015 |          | 5/19/2015     |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.25          | U        | 0.25          | 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-Trichloroethane                             | µg/L  | 5   | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.25          | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 160           |          | 160            |          | 110           |          | 0.5           | U        | 16.1          |          | 17.5          |          | 20.8          |          | 8.93          |          | 11.6          |          | 8.17          |          | 8.29      |          | 2.71          |          |
| 1,2-Dichloroethane                                | µg/L  | 5   | 6.5           |          | 6.2            |          | 5.1           |          | 0.25          | U        | 0.25          | U        | 0.414         | J        | 0.347         | J        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        |
| Trichloroethene                                   | µg/L  | 5   | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.25          | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

- µg/L - micrograms per liter
- H - Result may be biased high. Details are provided in the validation report.
- 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.
- ID - identification
- MCL - Maximum Contaminant Limit
- mg/L - milligrams per liter
- PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level
- ppb - parts per billion
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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW09        |          |            |          |               |          |           |          |               |          |               |          |               |          |               |          | 67WW09A        |          |                 |          |                |          |                |          |
|---|-------|-----|---------------|----------|------------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|-----------------|----------|----------------|----------|----------------|----------|
|   |       |     | 67WW09-111815 |          | 67WW09FD-  |          | 67WW09-051816 |          | 67WW09FD- |          | 67WW09-112717 |          | 67WW09-180502 |          | 67WW09-181023 |          | 67WW09-190503 |          | 67WW09A-092713 |          | 67WW09A-092713- |          | 67WW09A-012314 |          | 67WW09A-050614 |          |
|   |       |     | 11/18/2015    |          | 11/18/2015 |          | 5/18/2016     |          | 5/18/2016 |          | 11/27/2017    |          | 5/2/2018      |          | 10/23/2018    |          | 5/3/2019      |          | 9/27/2013      |          | 9/27/2013       |          | 1/23/2014      |          | 5/6/2014       |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result     | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result          | Val Qual | Result         | Val Qual | Result         | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5       | U        | 1             | 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-Trichloroethane                             | µg/L  | 5   | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5       | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5             | U        | 0.5            | U        | 0.5            | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 1.66          | J        | 1.62       | J        | 1             | U        | 1         | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1              | U        | 1               | U        | 1              | U        | 1              | U        |
| 1,2-Dichloroethane                                | µg/L  | 5   | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5       | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5             | U        | 0.5            | U        | 0.5            | U        |
| Trichloroethene                                   | µg/L  | 5   | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5       | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5            | U        | 0.5             | U        | 0.5            | U        | 0.5            | U        |

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- µg/L - micrograms per liter
- H - Result may be biased high. Details are provided in the validation report.
- J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
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- MCL - Maximum Contaminant Limit
- mg/L - milligrams per liter
- PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level
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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW09A        |          |            |          |                |          |            |          |                |          |                |          |                |          |                |          |                |          |                |          |                |          |                |          |
|---|-------|-----|----------------|----------|------------|----------|----------------|----------|------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|
|   |       |     | 67WW09A-072414 |          | 67WW09AFD- |          | 67WW09A-120314 |          | 67WW09AFD- |          | 67WW09A-021015 |          | 67WW09A-051215 |          | 67WW09A-111815 |          | 67WW09A-051816 |          | 67WW09A-112917 |          | 67WW09A-180503 |          | 67WW09A-181025 |          | 67WW09A-190502 |          |
|   |       |     | 7/24/2014      |          | 7/24/2014  |          | 12/3/2014      |          | 12/3/2014  |          | 2/10/2015      |          | 5/12/2015      |          | 11/18/2015     |          | 5/18/2016      |          | 11/29/2017     |          | 5/3/2018       |          | 10/25/2018     |          | 5/2/2019       |          |
| Parameter                                 | Units | MCL | Result         | Val Qual | Result     | Val Qual | Result         | Val Qual | Result     | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 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              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 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              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 1              | U        | 1          | U        | 1              | U        | 1          | U        | 1              | U        | 1              | U        | 1              | U        | 1              | U        | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 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              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| Trichloroethene                           | µg/L  | 5   | 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              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

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ppb - parts per billion

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW10        |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW10-092713 |          | 67WW10-012414 |          | 67WW10-050614 |          | 67WW10-072414 |          | 67WW10-120314 |          | 67WW10-021015 |          | 67WW10-051215 |          | 67WW10-111815 |          | 67WW10-051816 |          | 67WW10-112917 |          | 67WW10-180503 |          | 67WW10-181022 |          |
|   |       |     | 9/27/2013     |          | 1/24/2014     |          | 5/6/2014      |          | 7/24/2014     |          | 12/3/2014     |          | 2/10/2015     |          | 5/12/2015     |          | 11/18/2015    |          | 5/18/2016     |          | 11/29/2017    |          | 5/3/2018      |          | 10/22/2018    |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 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             | U        | 0.5           | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                             | µg/L  | 5   | 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             | U        | 0.5           | U        | 0.5           | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 0.5           | U        | 0.5           | U        |
| 1,2-Dichloroethane                                | µg/L  | 5   | 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             | U        | 0.5           | U        | 0.5           | U        |
| Trichloroethene                                   | µg/L  | 5   | 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             | U        | 0.5           | U        | 0.5           | U        |

Notes:

Blue Highlighting indicates concentrations above the MCL/PCL.

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW10        |          | 67WW11        |          |                |          |               |          |            |          |               |          |           |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|----------------|----------|---------------|----------|------------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW10-190502 |          | 67WW11-060113 |          | 67WW11-060113- |          | 67WW11-100213 |          | 67WW11 FD- |          | 67WW11-012314 |          | 67WW11FD- |          | 67WW11-072414 |          | 67WW11-120414 |          | 67WW11-021115 |          | 67WW11-051915 |          | 67WW11-111915 |          |
|   |       |     | 5/2/2019      |          | 6/1/2013      |          | 6/1/2013       |          | 10/2/2013     |          | 1/23/2014  |          | 1/23/2014     |          | 1/23/2014 |          | 7/24/2014     |          | 12/4/2014     |          | 2/11/2015     |          | 5/19/2015     |          | 11/19/2015    |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result     | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5           | U        | 0.25          | U        | 0.25           | 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-Trichloroethane                     | µg/L  | 5   | 0.5           | U        | 0.25          | U        | 0.25           | 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-Dichloroethene                        | µg/L  | 7   | 0.5           | U        | 47.1          |          | 46.8           |          | 42.8          |          | 43         |          | 38.8          |          | 43        |          | 34.5          |          | 37.5          |          | 30.4          |          | 21.6          |          | 28.5          |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 0.5           | U        | 0.869         | J        | 0.85           | J        | 0.799         | J        | 0.823      | J        | 0.748         | J        | 0.823     | J        | 0.684         | J        | 0.567         | J        | 0.559         | J        | 0.518         | J        | 0.513         | J        |
| Trichloroethene                           | µg/L  | 5   | 0.5           | U        | 0.25          | U        | 0.25           | 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        |

Notes:  
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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW11        |          |               |          |               |          |               |          |               |          | 67WW12        |          |               |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW11-051916 |          | 67WW11-112717 |          | 67WW11-180502 |          | 67WW11-181023 |          | 67WW11-190501 |          | 67WW12-060113 |          | 67WW12-100113 |          | 67WW12-012414 |          | 67WW12-050614 |          | 67WW12-072514 |          | 67WW12-120314 |          | 67WW12-021015 |          |
|   |       |     | 5/19/2016     |          | 11/27/2017    |          | 5/2/2018      |          | 10/23/2018    |          | 5/1/2019      |          | 6/1/2013      |          | 10/1/2013     |          | 1/24/2014     |          | 5/6/2014      |          | 7/25/2014     |          | 12/3/2014     |          | 2/10/2015     |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 19.3          |          | 5.2           |          | 5.5           |          | 6.1           |          | 2.8           |          | 0.5           | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        | 1             | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 0.396         | J        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |
| Trichloroethene                           | µg/L  | 5   | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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.

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW12        |          |            |          |               |          |               |          |               |          |                |          |               |          |               |          |               |          | 67WW13        |          |               |          |               |          |
|---|-------|-----|---------------|----------|------------|----------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW12-051215 |          | 67WW12FFD- |          | 67WW12-111815 |          | 67WW12-051816 |          | 67WW12-112917 |          | 67WW12-112917- |          | 67WW12-180503 |          | 67WW12-181022 |          | 67WW12-190502 |          | 67WW13-053113 |          | 67WW13-100113 |          | 67WW13-012414 |          |
|   |       |     | 5/12/2015     |          | 11/18/2015 |          | 11/18/2015    |          | 5/18/2016     |          | 11/29/2017    |          | 11/29/2017     |          | 5/3/2018      |          | 10/22/2018    |          | 5/2/2019      |          | 5/31/2013     |          | 10/1/2013     |          | 1/24/2014     |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result     | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 1              | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.25          | U        | 0.5           | U        | 1.25          | U        |
| 1,1,2-Trichloroethane                             | µg/L  | 5   | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 1              | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 2.91          | J        | 3.37          |          | 2.99          |          |
| 1,1-Dichloroethene                                | µg/L  | 7   | 1             | U        | 1          | U        | 1             | U        | 0.681         | J        | 2.2           |          | 1.8            |          | 0.5           | U        | 4.8           |          | 2.1           |          | 498           |          | 515           |          | 572           |          |
| 1,2-Dichloroethane                                | µg/L  | 5   | 0.5           | U        | 0.5        | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 1              | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 19.9          |          | 23.8          |          | 22.9          |          |
| Trichloroethene                                   | µg/L  | 5   | 0.5           | U        |            |          | 0.5           | U        | 0.5           | U        | 1             | U        | 1              | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 2.71          | J        | 2.81          |          | 2.86          |          |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

µg/L - micrograms per liter

H - Result may be biased high. Details are provided in the validation report.

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.

ID - identification

MCL - Maximum Contaminant Limit

mg/L - milligrams per liter

PCL - Texas Risk Reduction Program (TRRP) Tier 1 Groundwater Residential Protective Concentration Level

ppb - parts per billion

U - Undetected: The analyte was analyzed for, but not detected.

Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW13    |          |               |          |           |          |               |          |           |          |               |          |           |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|-----------|----------|---------------|----------|-----------|----------|---------------|----------|-----------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW13FD- |          | 67WW13-050614 |          | 67WW13FD- |          | 67WW13-072514 |          | 67WW13FD- |          | 67WW13-120414 |          | 67WW13FD- |          | 67WW13-021115 |          | 67WW13-051915 |          | 67WW13-111815 |          | 67WW13-051916 |          | 67WW13-112817 |          |
|   |       |     | 1/24/2014 |          | 5/6/2014      |          | 5/6/2014  |          | 7/25/2014     |          | 7/25/2014 |          | 12/4/2014     |          | 12/4/2014 |          | 2/11/2015     |          | 5/19/2015     |          | 11/18/2015    |          | 5/19/2016     |          | 11/28/2017    |          |
| Parameter                                 | Units | MCL | Result    | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 1.25      | U        | 1             | U        | 1         | U        | 0.5           | U        | 0.5       | U        | 2.5           | U        | 2.5       | U        | 1.25          | U        | 1.25          | U        | 1.25          | U        | 1             | U        | 1             | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 3.01      |          | 1.99          | J        | 1.95      | J        | 3.48          |          | 3.56      |          | 4.4           | J        | 4.56      | J        | 4.87          |          | 5.96          |          | 7.66          |          | 7             |          | 5.1           |          |
| 1,1-Dichloroethene                        | µg/L  | 7   | 569       |          | 240           |          | 228       |          | 353           |          | 362       |          | 572           |          | 522       |          | 521           |          | 522           |          | 762           |          | 274           |          | 320           |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 22.9      |          | 13.7          |          | 12.9      |          | 19.8          |          | 20.1      |          | 24.9          |          | 24.6      |          | 26            |          | 30.6          |          | 42.6          |          | 35.7          |          | 32            |          |
| Trichloroethene                           | µg/L  | 5   | 2.99      |          | 1.25          | J        | 1.27      | J        | 1.72          |          | 1.71      |          | 1.65          | J        | 1.94      | J        | 2.63          |          | 2.91          |          | 3.32          |          | 1.67          | J        | 1             | U        |

Notes:  
Blue Highlighting indicates concentrations above the MCL/PCL.

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mg/L - milligrams per liter

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br><br>Sample ID<br><br>Sample Date |       |     | 67WW13        |          |          |          |               |          |               |          |                |          | 67WW14        |          |                |          |               |          |               |          |               |          |               |          |               |          |
|---|-------|-----|---------------|----------|----------|----------|---------------|----------|---------------|----------|----------------|----------|---------------|----------|----------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW13-180501 |          | 67WW13-  |          | 67WW13-181023 |          | 67WW13-190501 |          | 67WW13-190501- |          | 67WW14-100113 |          | 67WW14-100113- |          | 67WW14-012414 |          | 67WW14-050714 |          | 67WW14-072514 |          | 67WW14-120314 |          | 67WW14-021015 |          |
|   |       |     | 5/1/2018      |          | 5/1/2018 |          | 10/23/2018    |          | 5/1/2019      |          | 5/1/2019       |          | 10/1/2013     |          | 10/1/2013      |          | 1/24/2014     |          | 5/7/2014      |          | 7/25/2014     |          | 12/3/2014     |          | 2/10/2015     |          |
| Parameter   | Units | MCL | Result        | Val Qual | Result   | Val Qual | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result         | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                             | µg/L  | 200 | 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        | 0.5           | U        | 0.5           | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                             | µg/L  | 5   | 4.8           |          | 4.7      |          | 6.1           |          | 3.9           |          | 3.8            |          | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |
| 1,1-Dichloroethene                                | µg/L  | 7   | 160           |          | 170      |          | 570           |          | 200           |          | 160            |          | 1.82          | J        | 2.22           |          | 2.58          |          | 4.27          |          | 3.57          |          | 4.73          |          | 3.46          |          |
| 1,2-Dichloroethane                                | µg/L  | 5   | 27            |          | 28       |          | 43            |          | 24            |          | 23             |          | 0.692         | J        | 0.849          | J        | 0.666         | J        | 0.897         | J        | 1.31          |          | 0.79          | J        | 0.64          | J        |
| Trichloroethene                                   | µg/L  | 5   | 0.5           | U        | 0.5      | U        | 2.4           |          | 1.1           |          | 1              |          | 0.5           | U        | 0.5            | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        |

Notes:

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW14    |          |               |          |           |          |               |          |               |          |               |          |               |          |               |          |               |          | 67WW15        |          |               |          |               |          |
|---|-------|-----|-----------|----------|---------------|----------|-----------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|---------------|----------|
|   |       |     | 67WW14FD- |          | 67WW14-051215 |          | 67WW14FD- |          | 67WW14-111815 |          | 67WW14-051816 |          | 67WW14-112717 |          | 67WW14-180502 |          | 67WW14-181022 |          | 67WW14-190502 |          | 67WW15-051916 |          | 67WW15-112717 |          | 67WW15-180502 |          |
|   |       |     | 2/10/2015 |          | 5/12/2015     |          | 5/12/2015 |          | 11/18/2015    |          | 5/18/2016     |          | 11/27/2017    |          | 5/2/2018      |          | 10/22/2018    |          | 5/2/2019      |          | 5/19/2016     |          | 11/27/2017    |          | 5/2/2018      |          |
| Parameter                                 | Units | MCL | Result    | Val Qual | Result        | Val Qual | Result    | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual | Result        | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5       | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 0.5       | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 22.7          |          | 5.6           |          | 5.6           |          |
| 1,1-Dichloroethene                        | µg/L  | 7   | 3.61      |          | 2.77          |          | 2.93      |          | 26.3          | J        | 10.8          |          | 5.6           |          | 4.2           |          | 6.6           |          | 5.3           |          | 2460          |          | 510           |          | 380           |          |
| 1,2-Dichloroethane                        | µg/L  | 5   | 0.657     | J        | 0.799         | J        | 0.815     | J        | 5.83          |          | 3.54          |          | 3.1           |          | 1.9           |          | 2.5           |          | 1.8           |          | 117           |          | 27            |          | 26            |          |
| Trichloroethene                           | µg/L  | 5   | 0.5       | U        | 0.5           | U        | 0.5       | U        | 0.5           | U        | 0.5           | U        | 1             | U        | 0.5           | U        | 0.5           | U        | 0.5           | U        | 5.48          | J        | 1             | U        | 1.2           |          |

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Table 2-5  
LHAAP-67 Historic Contaminants of Concern

| Location Code<br>Sample ID<br>Sample Date |       |     | 67WW15        |          |               |          | 67WW16I        |          |                |          |                |          |                |          |
|---|-------|-----|---------------|----------|---------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|
|   |       |     | 67WW15-181023 |          | 67WW15-190503 |          | 67WW16I-112917 |          | 67WW16I-180503 |          | 67WW16I-181025 |          | 67WW16I-190501 |          |
|   |       |     | 10/23/2018    |          | 5/3/2019      |          | 11/29/2017     |          | 5/3/2018       |          | 10/25/2018     |          | 5/1/2019       |          |
| Parameter                                 | Units | MCL | Result        | Val Qual | Result        | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual | Result         | Val Qual |
| 1,1,1-Trichloroethane                     | µg/L  | 200 | 0.5           | U        | 0.5           | U        | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,1,2-Trichloroethane                     | µg/L  | 5   | 6             |          | 5.4           |          | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,1-Dichloroethene                        | µg/L  | 7   | 670           |          | 330           |          | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| 1,2-Dichloroethane                        | µg/L  | 5   | 30            |          | 22            |          | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |
| Trichloroethene                           | µg/L  | 5   | 1.4           |          | 1.1           |          | 1              | U        | 0.5            | U        | 0.5            | U        | 0.5            | U        |

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**Table 2-6**  
**Well Maintenance Activities Year 5 RA-O**

| Well ID | Date Inspected | Pads | Bollards | Protective Casings | Locks    | Date Mowed | Photos | Comments |
|---------|----------------|------|----------|--------------------|----------|------------|--------|----------|
| 67WW01  | 10/25/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW02  | 10/25/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/01/19       |      |          |                    |          |            | Yes    |          |
| 67WW03  | 10/22/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW04  |                | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW05  | 10/25/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW06  |                | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW07  | 10/25/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW08  | 10/23/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/01/19       |      |          |                    |          |            | Yes    |          |
| 67WW09  | 10/23/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW09A | 10/25/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW10  | 10/22/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW11  | 10/23/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/01/19       |      |          |                    |          |            | Yes    |          |
| 67WW12  | 10/22/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW13  | 10/23/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/01/19       |      |          |                    |          |            | Yes    |          |
| 67WW14  | 10/22/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/02/19       |      |          |                    |          |            | Yes    |          |
| 67WW15  | 10/23/18       | Good | Good     | Good               | In Place | 04/29/19   | Yes    |          |
|         | 05/03/19       |      |          |                    |          |            | Yes    |          |
| 67WW16I | 10/25/18       | Good | Good     | Good               | In Place | 43584.00   | Yes    |          |
|         | 05/01/19       |      |          |                    |          |            | Yes    |          |

Notes:

RA-O - remedial action operation

**Table 2-7**  
**Year 6 RA-O Sampling**

| Monitoring Well ID   | VOCs | Field Parameters | MNA Parameters | Water Levels |
|----------------------|------|------------------|----------------|--------------|
| <b>Upper Shallow</b> |      |                  |                |              |
| 67WW01               | X    | X                |                | X            |
| 67WW02               | X    | X                |                | X            |
| 67WW03               | X    | X                |                | X            |
| 67WW04               |      |                  |                | X            |
| 67WW05               | X    | X                |                | X            |
| 67WW06               |      |                  |                | X            |
| 67WW07               | X    | X                |                | X            |
| 67WW08               | X    | X                | X              | X            |
| 67WW09               | X    | X                |                | X            |
| 67WW09A              | X    | X                |                | X            |
| 67WW10               | X    | X                |                | X            |
| 67WW11               | X    | X                |                | X            |
| 67WW12               | X    | X                |                | X            |
| 67WW13               | X    | X                | X              | X            |
| 67WW14               | X    | X                |                | X            |
| 67WW15               | X    | X                |                | X            |
| 67WW17 <sup>a</sup>  | X    | X                |                | X            |
| 67WW18 <sup>a</sup>  | X    | X                |                | X            |
| <b>Intermediate</b>  |      |                  |                |              |
| 67WW16I              | X    | X                |                | X            |

Notes:

Field parameters to be monitored for all wells: pH, temperature, conductivity, turbidity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and ferric iron.

MNA parameters include alkalinity, sulfate, sulfide, chloride, TOC, dissolved iron and manganese, total phosphorus, carbon dioxide, dissolved gases (methane, ethane, ethene) and total iron.

<sup>a</sup> Data from initial sampling of wells 67WW17 and 67WW18 will be used to evaluate the efficacy of the current monitoring network.

ID - identification

MNA - monitored natural attenuation

RA-O - remedial action operation

TOC - total organic carbon

VOCs - volatile organic compounds

X - well will be analyzed for that parameter

**Table 3-1**  
**Mann-Kendall Trend Summary, LHAAP-67**

| Monitoring Well | 1,1-DCE              | 1,2-DCA              | 1,1,2-TCA |
|-----------------|----------------------|----------------------|-----------|
| 67WW01          | Probably Increasing  | Significant Increase | NA        |
| 67WW02          | Significant Increase | NA                   | NA        |
| 67WW08          | Probably Decreasing  | Significant Decrease | NA        |
| 67WW13          | Stable               | Significant Increase | NA        |
| 67WW15          | No Trend             | Stable               | Stable    |

Notes:

DCA - dichloroethane

DCE - dichloroethene

MCL - maximum contaminant level

NA - not analyzed due to concentrations are below the MCL.

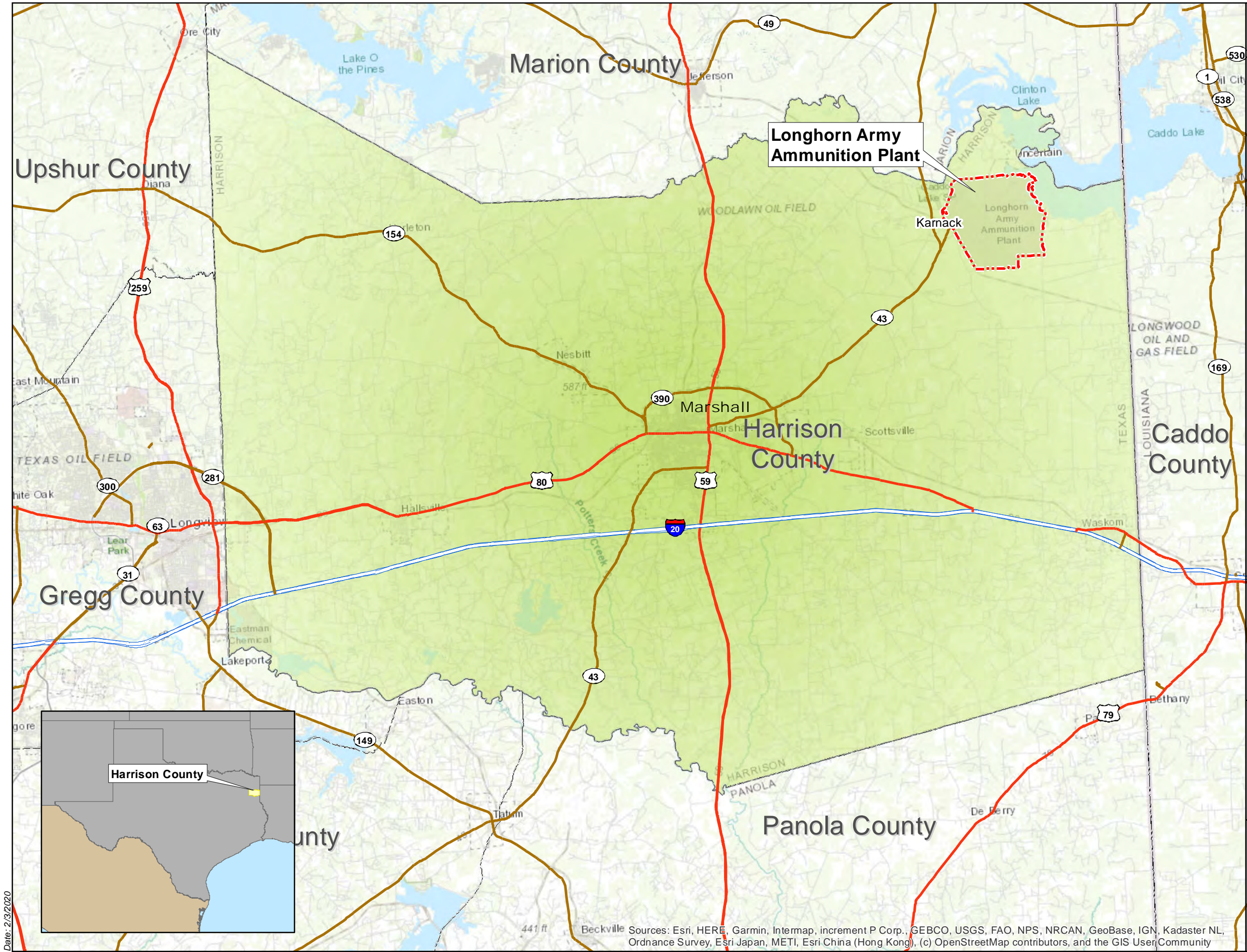
TCA - trichloroethane

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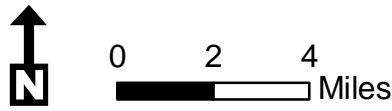
## Figures

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Note:  
1. RA-O = Remedial Action Operations



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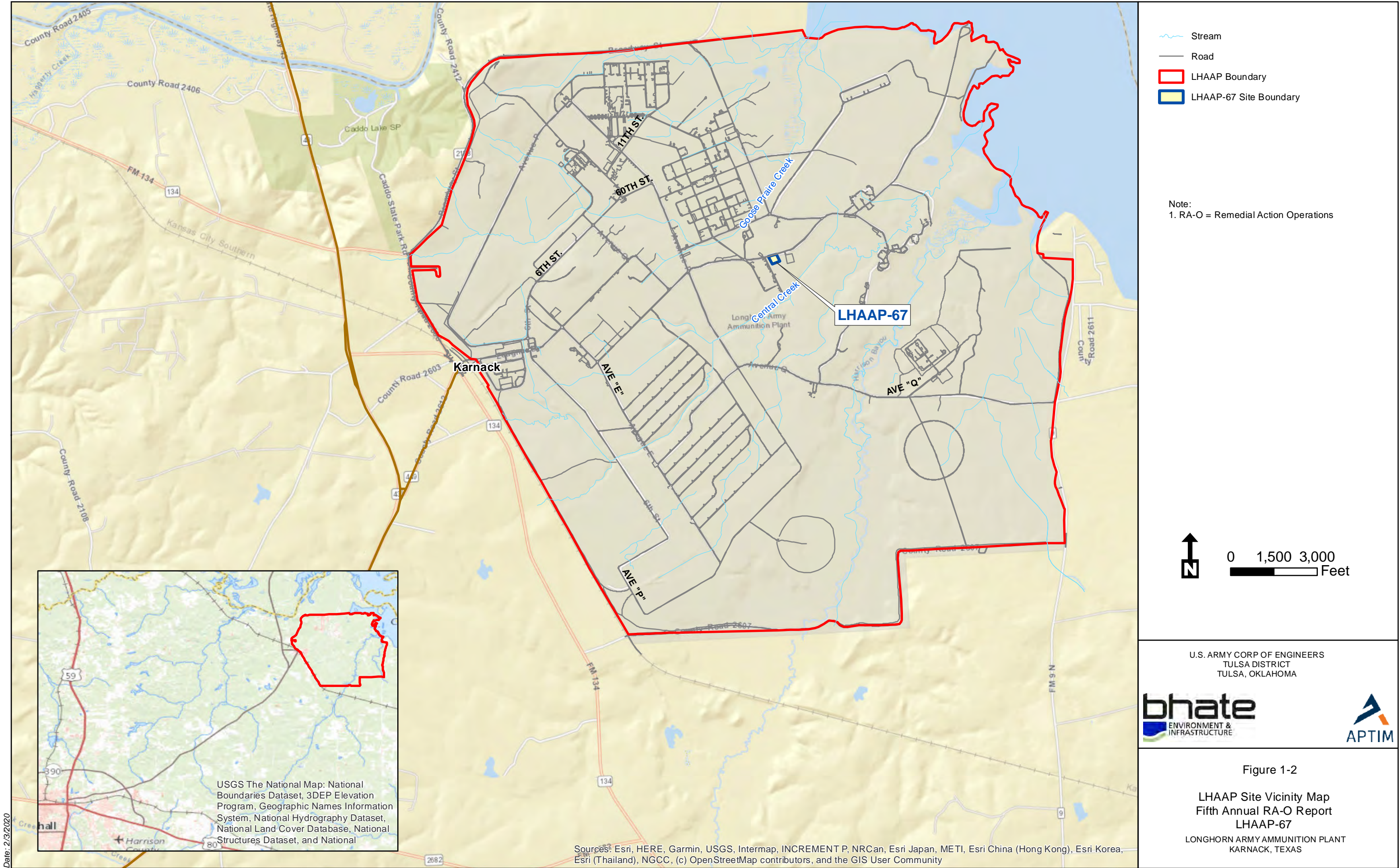
Figure 1-1

LHAAP Location Map  
Fifth Annual RA-O Report  
LHAAP-67

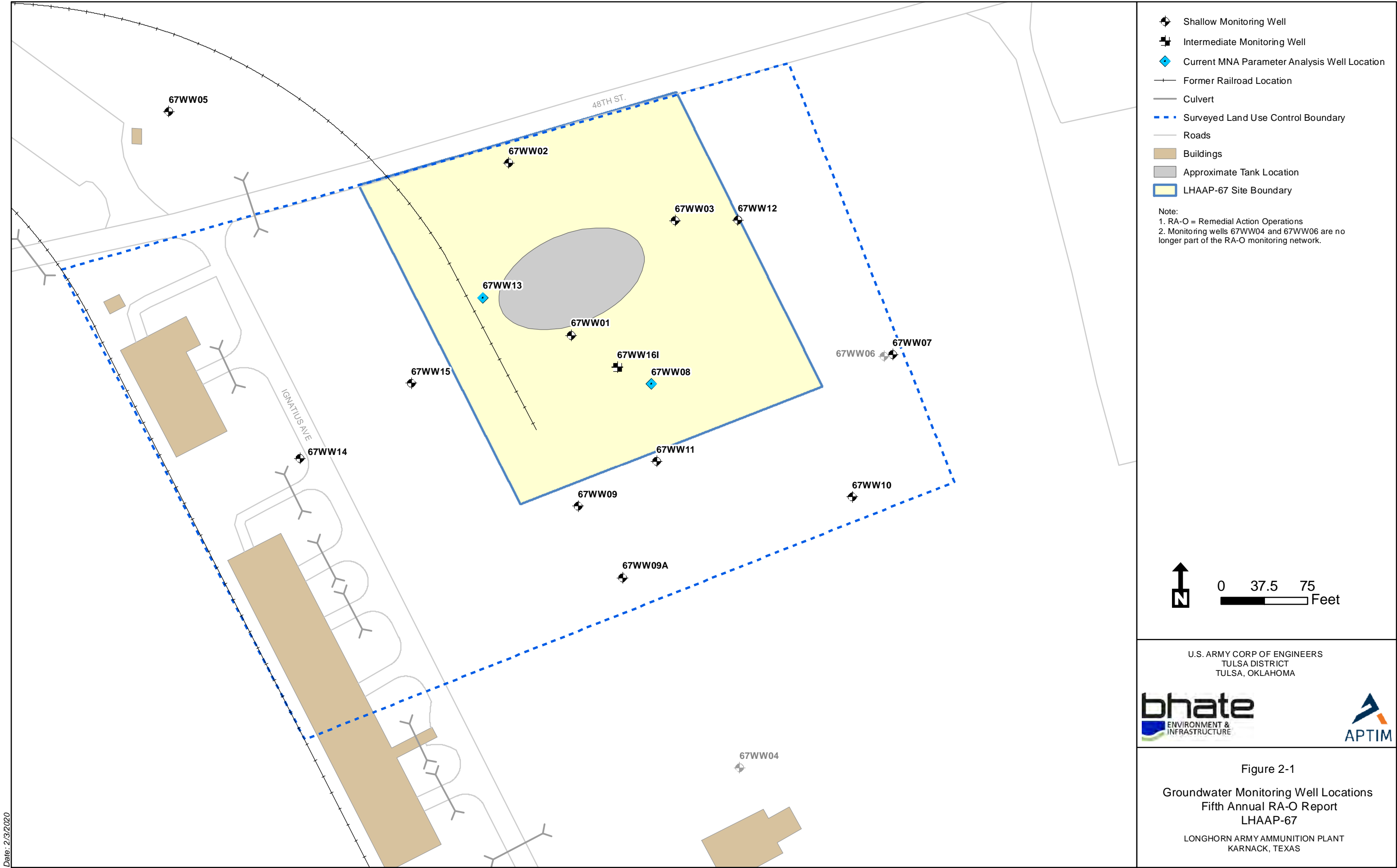
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

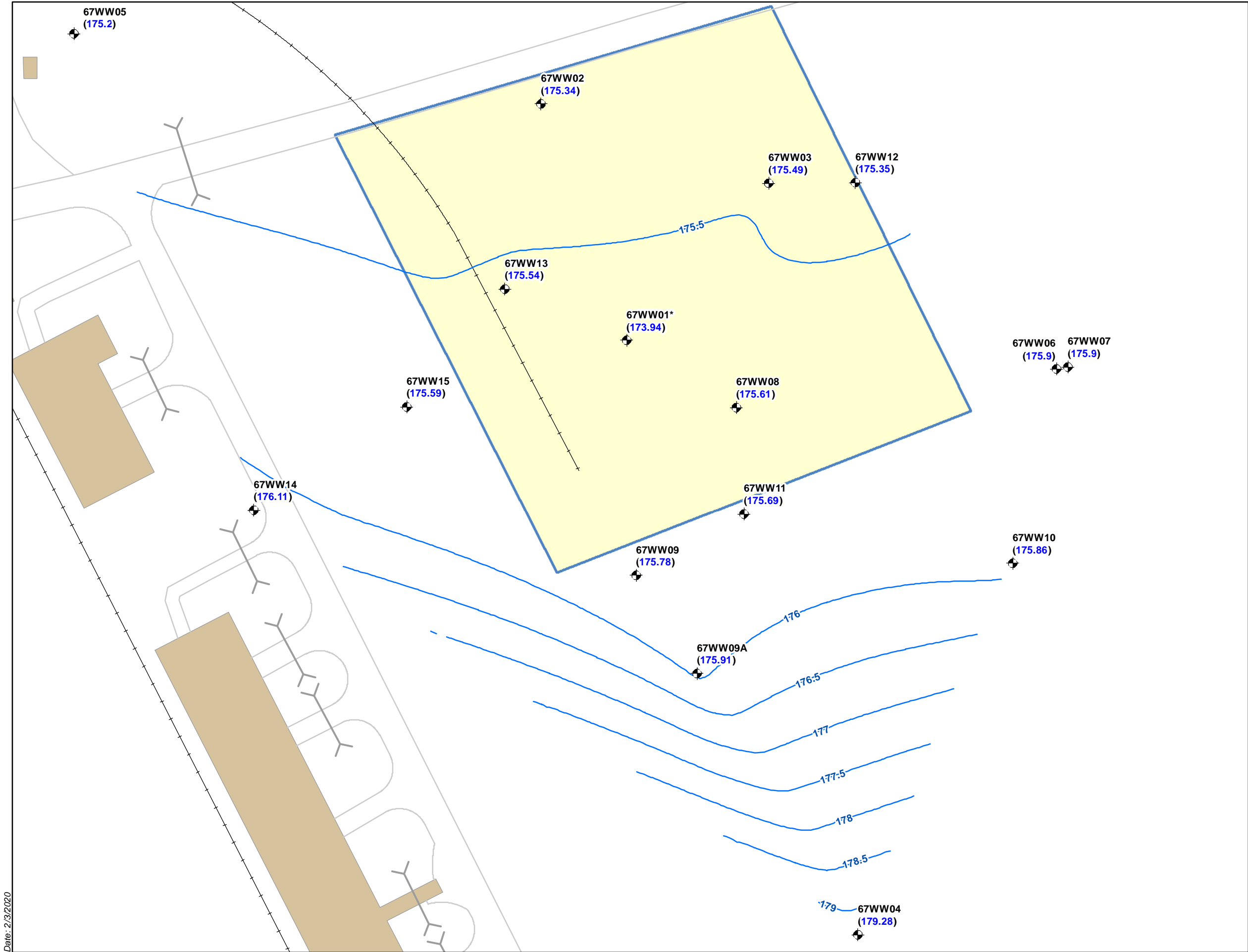
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community











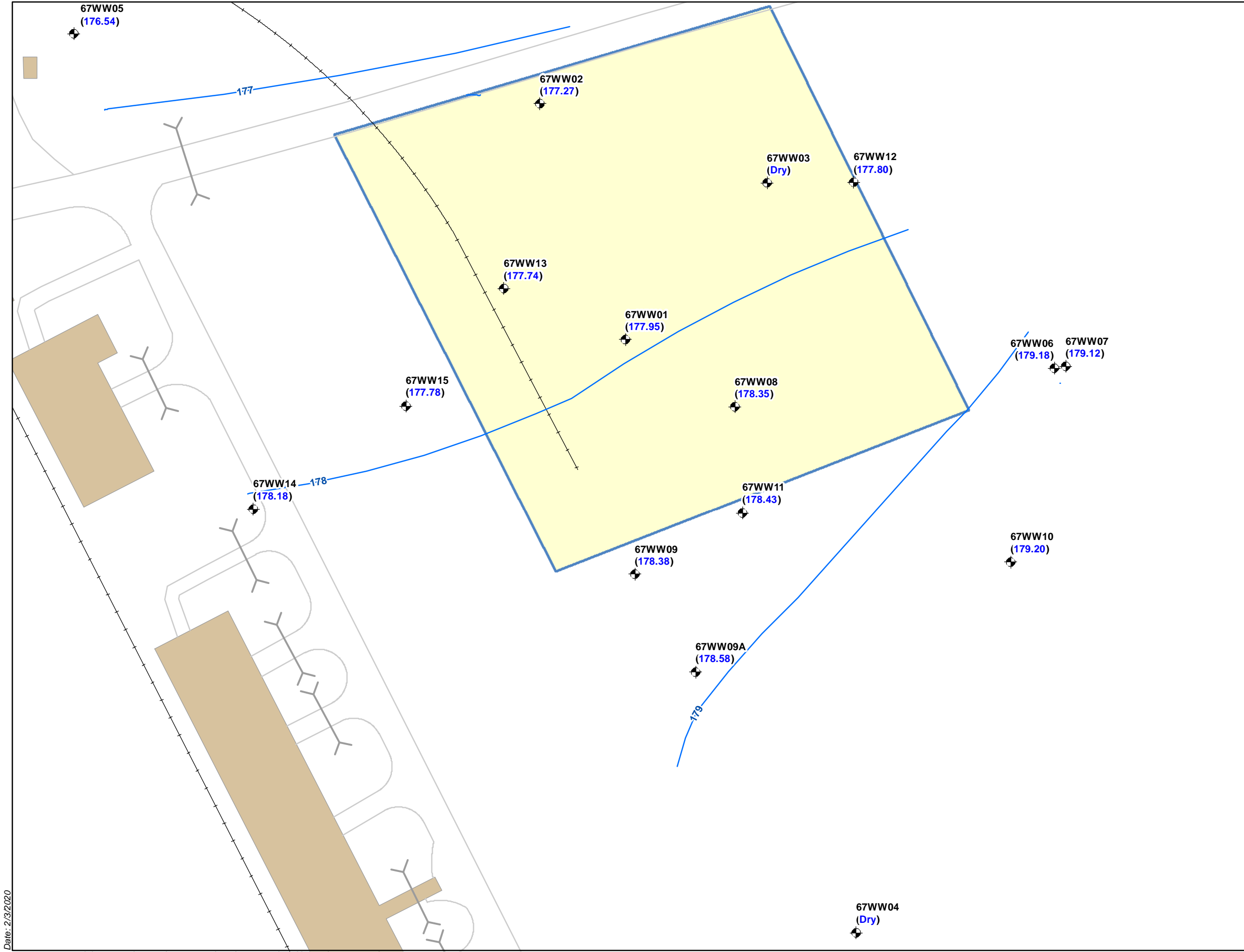
- Shallow Monitoring Well
  - Former Railroad Location
  - Groundwater Contour
  - Culvert
  - Roads
  - Buildings
- Note:
1. RA-O = Remedial Action Operations
  2. \* = 67WW01 appears anomalous and was not used to create the potentiometric contours.
  3. Groundwater elevations are presented in feet above mean sea level (MSL).



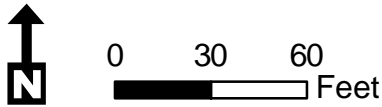
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TULSA, OKLAHOMA



Figure 2-2  
Shallow Zone Potentiometric  
Map - October 2018  
Fifth Annual RA-O Report  
LHAAP-67  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS



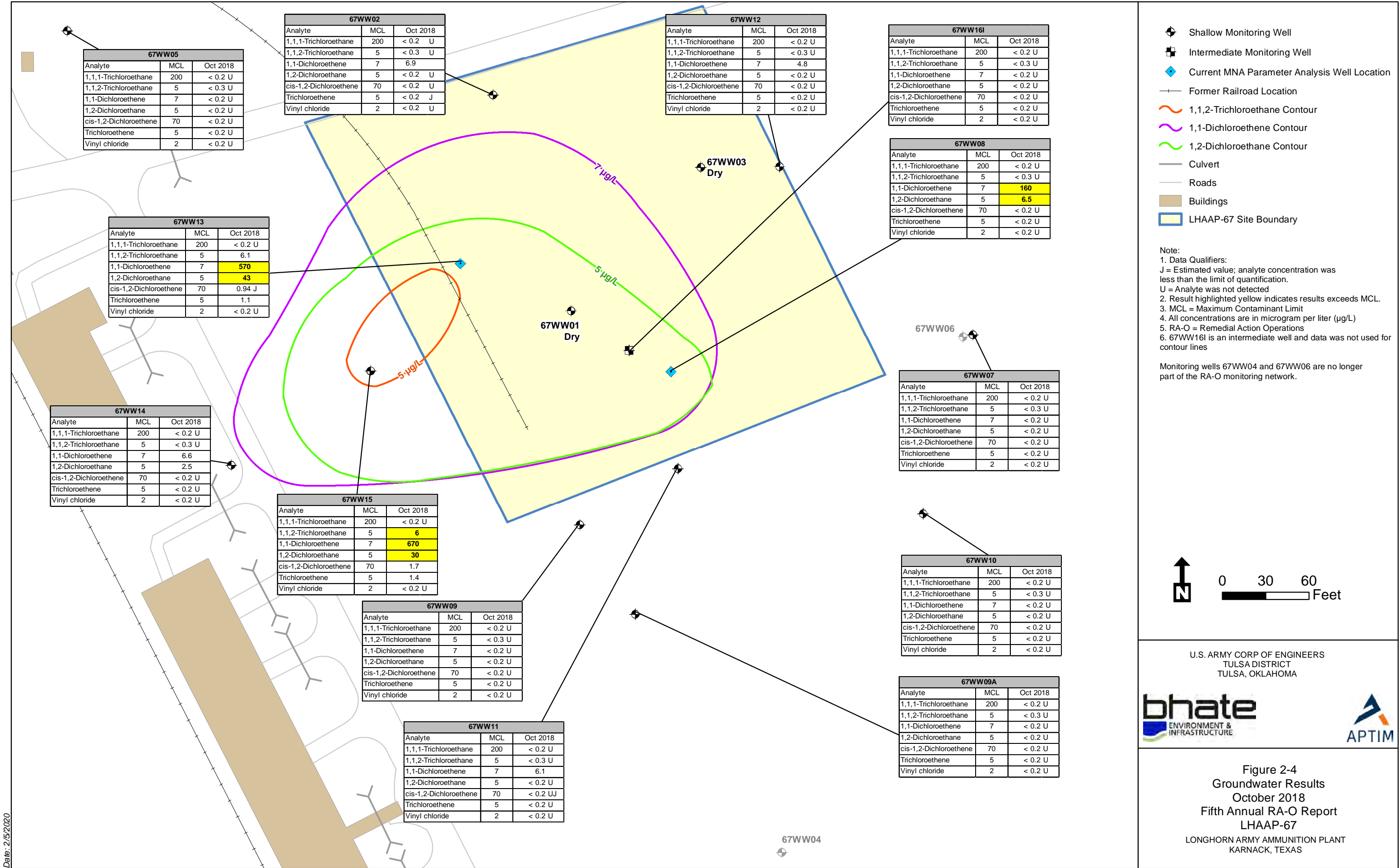
- Shallow Monitoring Well
  - Former Railroad Location
  - Groundwater Contour
  - Culvert
  - Roads
  - Buildings
- Note:
1. RA-O = Remedial Action Operations
  2. \* = 67WW07 appears anomalous and was not used to create the potentiometric contours.
  3. Groundwater elevations are presented in feet above mean sea level (MSL).

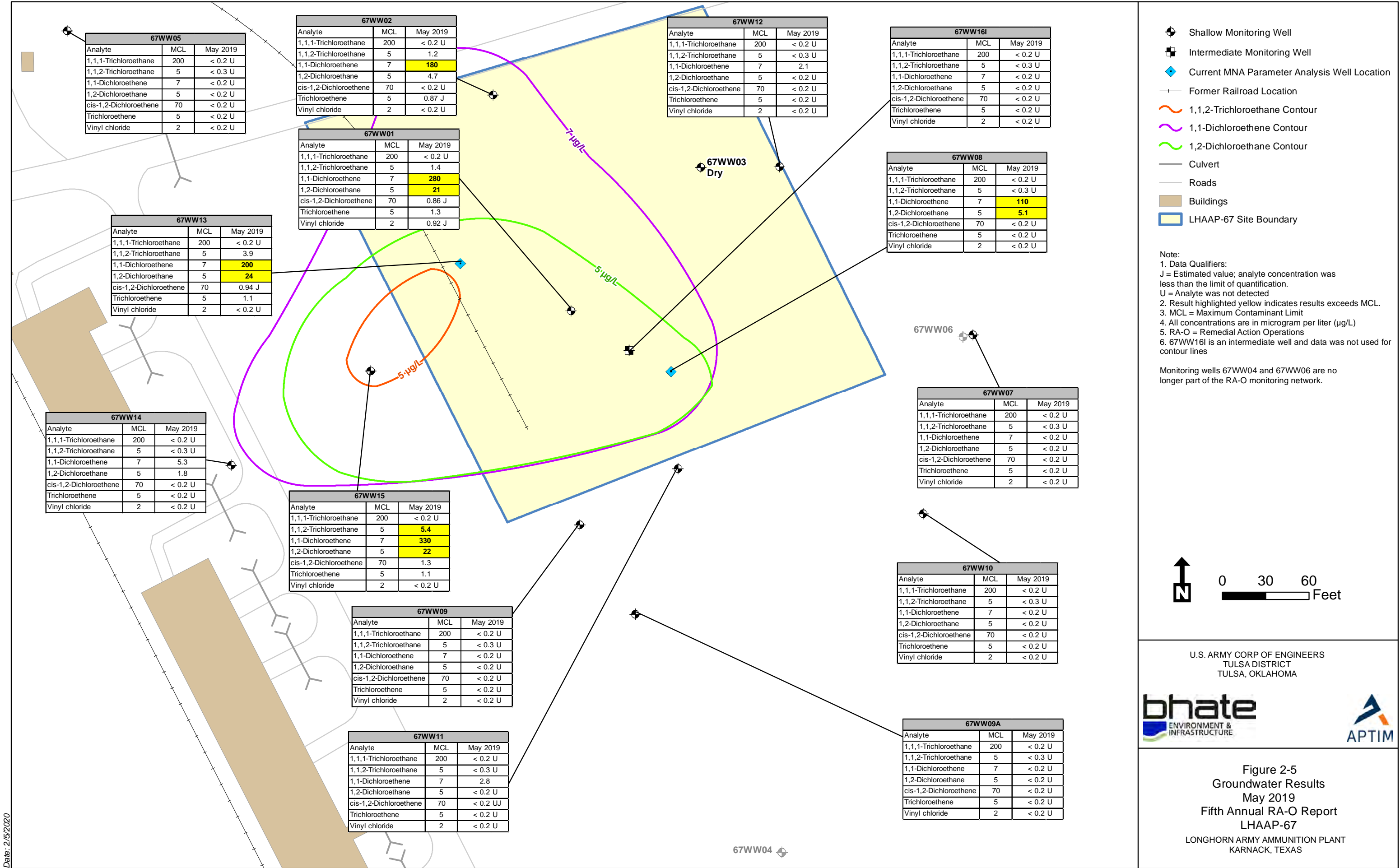


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TULSA DISTRICT  
TULSA, OKLAHOMA

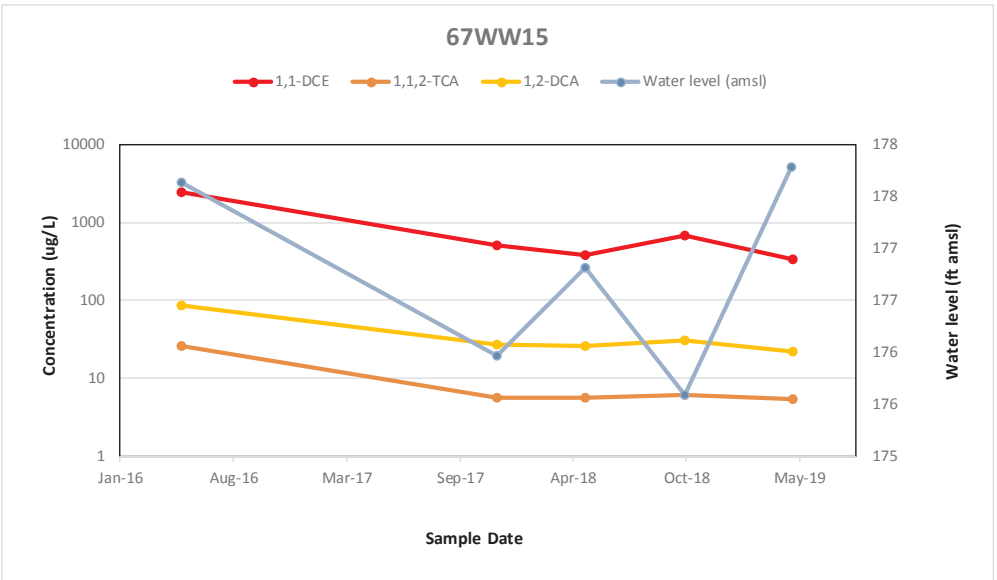
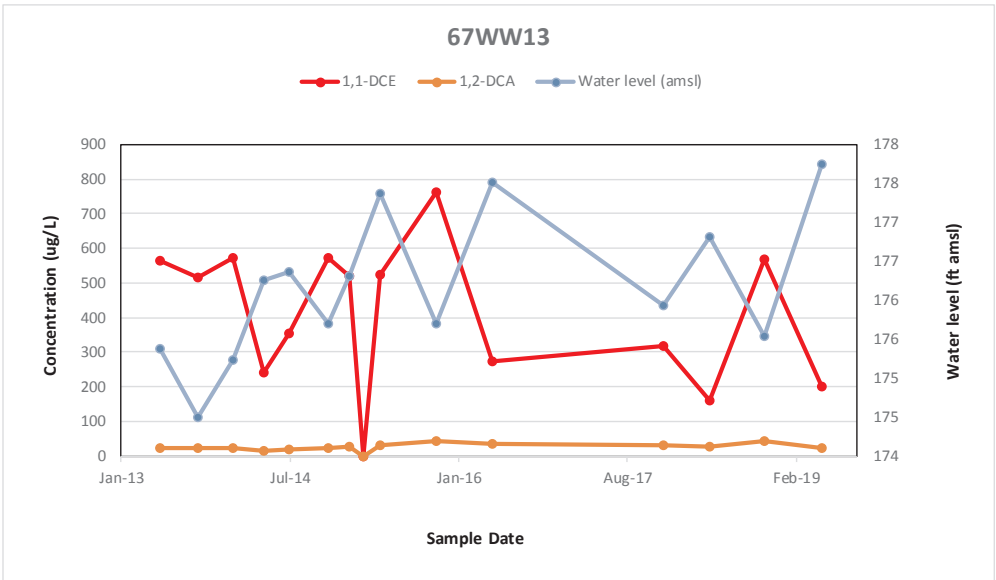
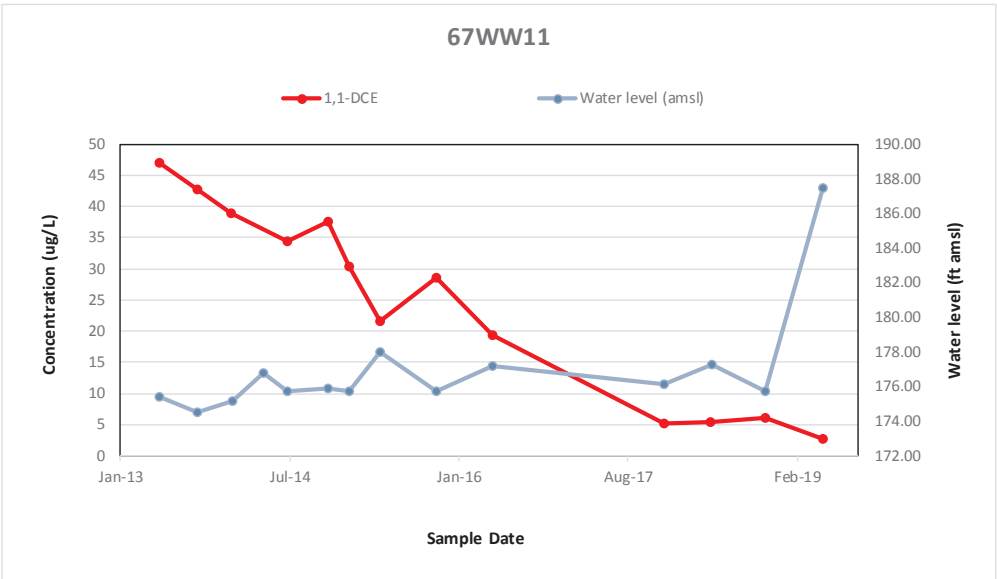
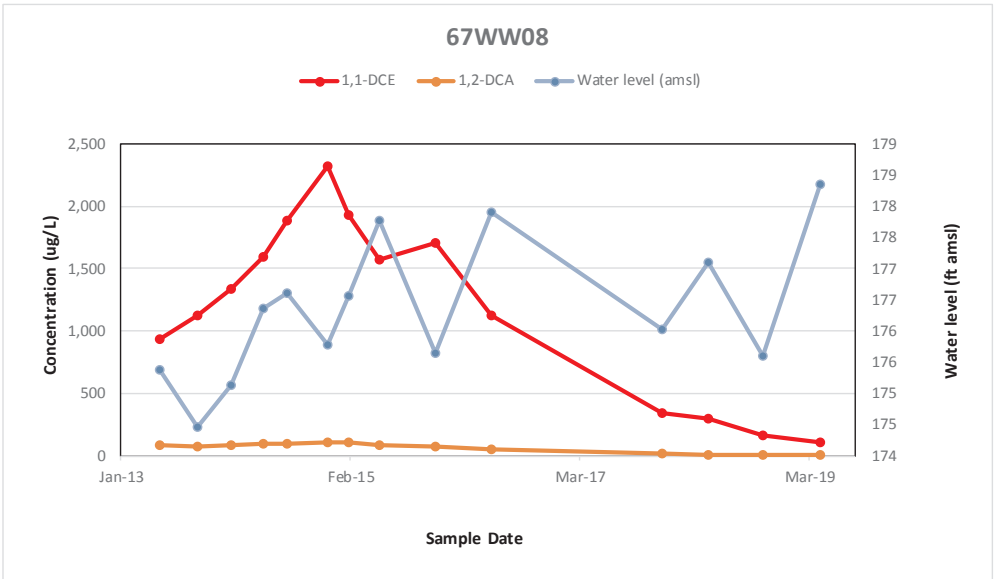
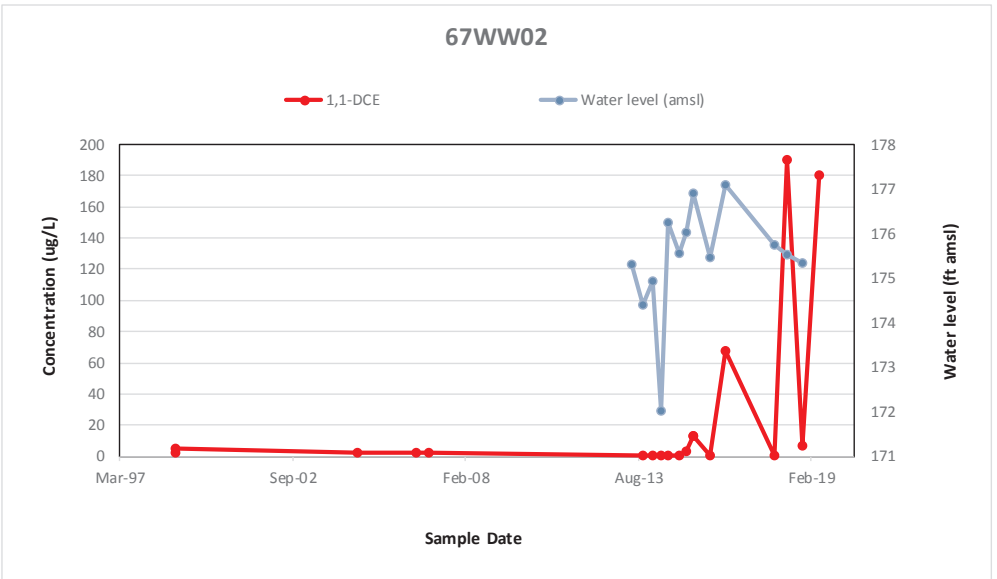
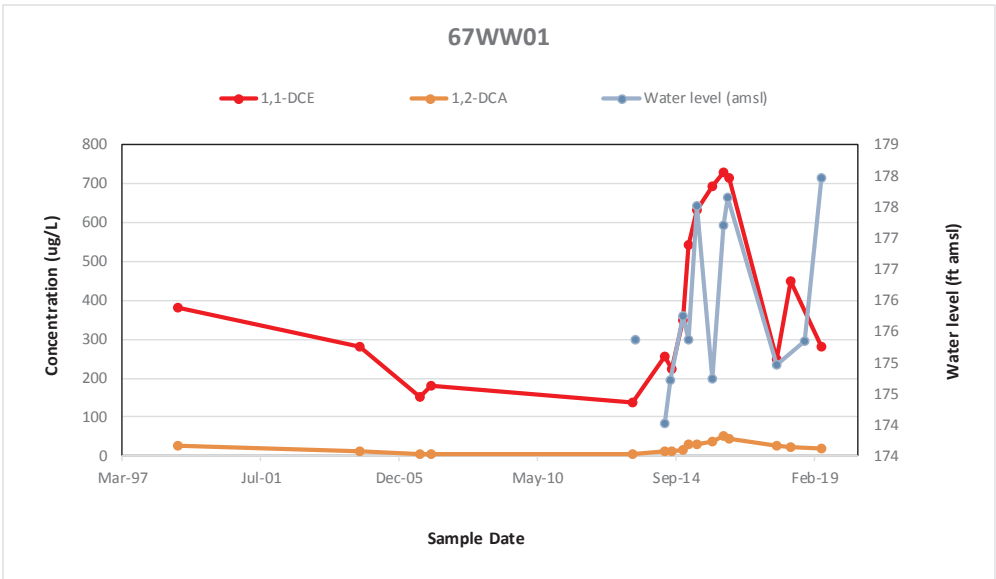
**bhate**  
ENVIRONMENT &  
INFRASTRUCTURE

Figure 2-3  
Shallow Zone Potentiometric  
Map - May 2019  
Fifth Annual RA-O Report  
LHAAP-67  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS









Cleanup Levels:  
1,1-Dichloroethene = 7 µg/L  
1,2-Dichloroethane = 5 µg/L  
1,1,2-Trichloroethane = 5 µg/L

Notes:  
1. RA-O = Remedial Action Operation

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TULSA, OKLAHOMA



Figure 2-6  
COC Concentration Trends  
Fifth Annual RA-O Report  
LHAAP-67  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

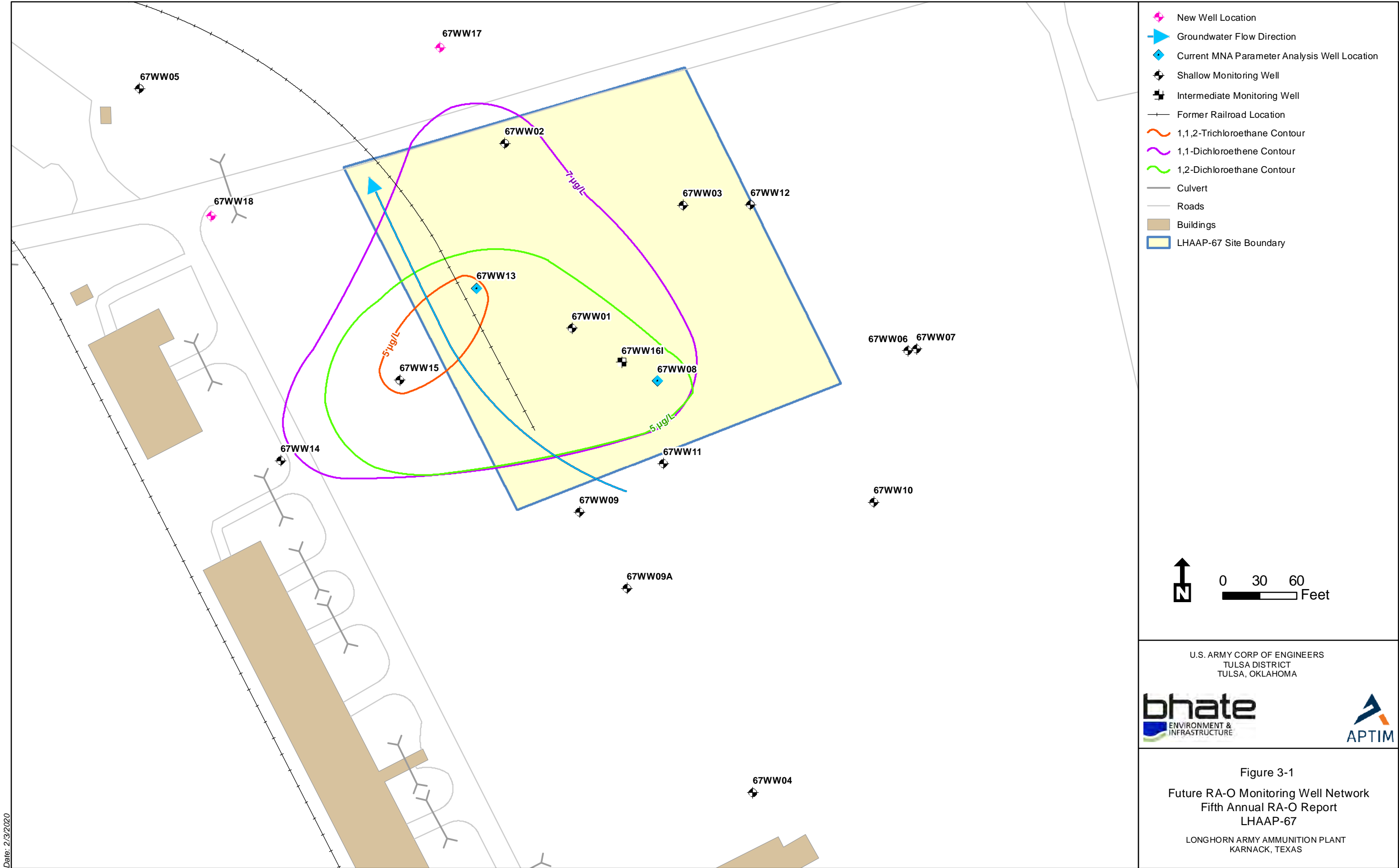


Figure 3-1  
Future RA-O Monitoring Well Network  
Fifth Annual RA-O Report  
LHAAP-67  
LONGHORN ARMY AMMUNITION PLANT  
KARNACK, TEXAS

# Appendix A

## Annual LUC Compliance Certification and Documentation



## Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated September 2011 for LHAAP-67 a certification of site was conducted by ADTm [indicate transferee] on 8/14/19.

A summary of land use control mechanisms is as follows:

Groundwater restriction – restriction of the use of groundwater to environmental monitoring and testing until cleanup levels are met [Indicate whether groundwater restrictions are still required at LHAAP-67]

A summary of compliance with land use and restriction covenants is as follows:

No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-67.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: August 14, 2019

Name/Title: Scott Beasinger / Senior Field Tech

Signature: Scott Beasinger

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

## Appendix B

# Photographic Log

**PHOTO LOG**

| Photo No. | Date       | Task and Description     |
|-----------|------------|--------------------------|
| 1         | 10-26-2018 | Well Inspection, 67WW01  |
| 2         | 10-26-2018 | Well Inspection, 67WW02  |
| 3         | 10-26-2018 | Well Inspection, 67WW03  |
| 4         | 10-26-2018 | Well Inspection, 67WW04  |
| 5         | 10-26-2018 | Well Inspection, 67WW05  |
| 6         | 10-26-2018 | Well Inspection, 67WW06  |
| 7         | 10-26-2018 | Well Inspection, 67WW07  |
| 8         | 10-26-2018 | Well Inspection, 67WW08  |
| 9         | 10-26-2018 | Well Inspection, 67WW09  |
| 10        | 10-26-2018 | Well Inspection, 67WW09A |
| 11        | 10-26-2018 | Well Inspection, 67WW10  |
| 12        | 10-26-2018 | Well Inspection, 67WW11  |
| 13        | 10-26-2018 | Well Inspection, 67WW12  |
| 14        | 10-26-2018 | Well Inspection, 67WW13  |
| 15        | 10-26-2018 | Well Inspection, 67WW14  |
| 16        | 10-26-2018 | Well Inspection, 67WW15  |
| 17        | 10-26-2018 | Well Inspection, 67WW16  |
| 18        | 5-3-2019   | Well Inspection, 67WW01  |
| 19        | 5-1-2019   | Well Inspection, 67WW02  |
| 20        | 5-2-2019   | Well Inspection, 67WW03  |
| 21        | 5-3-2019   | Well Inspection, 67WW04  |
| 22        | 5-2-2019   | Well Inspection, 67WW05  |
| 23        | 5-3-2019   | Well Inspection, 67WW06  |
| 24        | 5-3-2019   | Well Inspection, 67WW07  |
| 25        | 5-1-2019   | Well Inspection, 67WW08  |
| 26        | 5-3-2019   | Well Inspection, 67WW09  |
| 27        | 5-2-2019   | Well Inspection, 67WW09A |
| 28        | 5-2-2019   | Well Inspection, 67WW10  |
| 29        | 5-1-2019   | Well Inspection, 67WW11  |
| 30        | 5-2-2019   | Well Inspection, 67WW12  |
| 31        | 5-1-2019   | Well Inspection, 67WW13  |

**PHOTO LOG**

| Photo No. | Date      | Task and Description    |
|-----------|-----------|-------------------------|
| 32        | 5-2-2019  | Well Inspection, 67WW14 |
| 33        | 5-3-2019  | Well Inspection, 67WW15 |
| 34        | 5-1-2019  | Well Inspection, 67WW16 |
| 35        | 8-14-2019 | Northwest corner        |
| 36        | 8-14-2019 | North center of site    |
| 37        | 8-14-2019 | Middle of site          |
| 38        | 8-14-2019 | Northeast corner        |
| 39        | 8-14-2019 | Southeast corner        |
| 40        | 8-14-2019 | Southwest corner        |





PHOTO 1: Well Inspection, 67WW01

DATE: October 26, 2018



PHOTO 2: Well Inspection, 67WW02

DATE: October 26, 2018





PHOTO 3: Well Inspection, 67WW03  
DATE: October 26, 2018



PHOTO 4: Well Inspection, 67WW04  
DATE: October 26, 2018





PHOTO 5: Well Inspection, 67WW05

DATE: October 26, 2018



PHOTO 6: Well Inspection, 67WW06

DATE: October 26, 2018





PHOTO 7: Well Inspection, 67WW07

DATE: October 26, 2018



PHOTO 8: Well Inspection, 67WW08

DATE: October 26, 2018





PHOTO 9: Well Inspection, 67WW09

DATE: October 26, 2018



PHOTO 10: Well Inspection, 67WW09A

DATE: October 26, 2018





PHOTO 11: Well Inspection, 67WW10

DATE: October 26, 2018



PHOTO 12: Well Inspection, 67WW11

DATE: October 26, 2018





PHOTO 13: Well Inspection, 67WW12

DATE: October 26, 2018



PHOTO 14: Well Inspection, 67WW13

DATE: October 26, 2018





PHOTO 15: Well Inspection, 67WW14

DATE: October 26, 2018



PHOTO 16: Well Inspection, 67WW15

DATE: October 26, 2018





PHOTO 17: Well Inspection, 67WW16

DATE: October 26, 2018



PHOTO 18: Well Inspection, 67WW01

DATE: May 3, 2019





PHOTO 19: Well Inspection, 67WW02  
DATE: May 1, 2019



PHOTO 20: Well Inspection, 67WW03  
DATE: May 2, 2019





PHOTO 21: Well Inspection, 67WW04

DATE: May 3, 2019



PHOTO 22: Well Inspection, 67WW05

DATE: May 2, 2019





PHOTO 23: Well Inspection, 67WW06  
DATE: May 3, 2019



PHOTO 24: Well Inspection, 67WW07  
DATE: May 3, 2019





PHOTO 25: Well Inspection, 67WW08

DATE: May 1, 2019



PHOTO 26: Well Inspection, 67WW09

DATE: May 3, 2019





PHOTO 27: Well Inspection, 67WW09A

DATE: May 2, 2019



PHOTO 28: Well Inspection, 67WW10

DATE: May 2, 2019





PHOTO 29: Well Inspection, 67WW11

DATE: May 1, 2019



PHOTO 30: Well Inspection, 67WW12

DATE: May 2, 2019





PHOTO 31: Well Inspection, 67WW13

DATE: May 1, 2019



PHOTO 32: Well Inspection, 67WW14

DATE: May 2, 2019





PHOTO 33: Well Inspection, 67WW15  
DATE: May 3, 2019



PHOTO 34: Well Inspection, 67WW16  
DATE: May 1, 2019





PHOTO 35: Northwest Corner

DATE: August 14, 2019



PHOTO 36: North Center of Site

DATE: August 14, 2019





**PHOTO 37:** Middle of Site  
**DATE:** August 14, 2019



**PHOTO 38:** Northeast Corner  
**DATE:** August 14, 2019





PHOTO 39 Southeast Corner

DATE: August 14, 2019



PHOTO 40: Southwest Corner

DATE: August 14, 2019

## Appendix C

# Groundwater Sampling Forms



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW01

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

overcast

## SAMPLING INFORMATION

Sample No: 67WW01-1810 25DATE/TIME: 10/25/18 / 1034

Sample Interval: \_\_\_\_ - \_\_\_\_

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 NADepth to Water - Initial (DTWi) (ft) 26.98Purge End Date/Time: 10/25/18 NADepth to Well Bottom (ft) 27.00Discharge Tube Length: NAPID Reading: NAScreen Interval (ft): 17.00-27.00Discharge Tube Diameter: 1/4"Immersible Layer: Y ☒ NApproximate depth of pump inlet\*(ft): NAPump Start Time: NA



## 2 of 2

[illegible]

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW02

Project No: 501032

Sampler(s): SCOTT BEESINGER

## FIELD CONDITIONS

OVERCAST / LIGHT RAIN

## SAMPLING INFORMATION

Sample No: 67WW02-181025DATE/TIME: 10/25/18 / 0943Sample Interval: 24.35-24.60

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv   |
|------------------|-------|-----------|------------------------|-----------------|-----------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL < pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/25/18 0955Depth to Water - Initial (DTWi) (ft) 24.35Purge End Date/Time: 10/25/18 1025Depth to Well Bottom (ft) 27.92Discharge Tube Length: NAPID Reading: NAScreen Interval (ft): ~~17.00~~ 27.00Discharge Tube Diameter: 1/4"Immersible Layer: Y / N

18-28 SS

Approximate depth of pump inlet\* (ft): 25.50Pump Start Time: 0955

2ND CHECK Depth to well Bottom - 27.92



# Sample Collection Log

2 of 2

| Location ID: 67WW02 Sample No: 67WW02-1810 <u>25</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18   | 1000                         | 100        | 1.5         | 24.43                 | 3.99    | 18.48 | 6.44       | 12.5        | 75   | 2.00              |
| ↓  | 1005                         | 100        | 1.0         | 24.50                 | 4.00    | 18.40 | 6.48       | 6.6         | 124  | 1.41              |
|  | 1010                         | 100        | 1.5         | 24.54                 | 4.00    | 18.43 | 6.49       | 4.2         | 126  | 1.30              |
|  | 1015                         | 100        | 2.0         | 24.57                 | 4.00    | 18.46 | 6.50       | 3.0         | 127  | 1.29              |
|  | 1020                         | 100        | 2.5         | 24.59                 | 4.00    | 18.99 | 6.50       | 2.7         | 128  | 1.28              |
| ↓  | 1025                         | 100        | 3.0         | 24.60                 | 4.00    | 19.04 | 6.50       | 1.1         | 129  | 1.27              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW03

Project No: 501032

Sampler(s): Scott Beersinger

## FIELD CONDITIONS

CLEAR / Sunny

## SAMPLING INFORMATION

Sample No: 67WW03-181022

DATE/TIME: 10/22/18 / 1445

Sample Interval: NA - NA

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of Casing

Purging Method/Equipment: NA

Casing ID (in.): 4

Purge Start Date/Time: NA

Depth to Water - Initial (DTWi) (ft) Dry

Purge End Date/Time: NA

Depth to Well Bottom (ft) 24.95

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 14.80 - 24.80

Discharge Tube Diameter: NA Immersible Layer: Y / (N)

Approximate depth of pump inlet\* (ft): NA

Pump Start Time: NA



## 2 of 2

[illegible]

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW05

Project No: 501032

Sampler(s): Scott Beisinger

## FIELD CONDITIONS

OVERCAST / RAIN

## SAMPLING INFORMATION

Sample No: 67WW05-181025DATE/TIME: 10/25/18 / 0848Sample Interval: 250 26.07

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: low flow/Bladder pumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 0900Depth to Water - Initial (DTWi) (ft) 25.80Purge End Date/Time: 10/25/18 0930Depth to Well Bottom (ft) 30.20Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 20.00 - 30.00Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\* (ft): 28.00Pump Start Time: 0900

0933  
2ND Check Depth to well Bottom - 30.20



# Sample Collection Log

2 of 2

| Location ID: 67WW05 Sample No: 67WW05-1810 <u>25</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18   | 0905                         | 100        | .5          | 25.88                 | 2.89    | 17.16 | 5.09       | 79.5        | 191  | 0.67              |
|  | 0910                         | 100        | 1.0         | 25.95                 | 2.83    | 17.69 | 4.99       | 32.3        | 186  | 0.31              |
|  | 0915                         | 100        | 1.5         | 26.00                 | 2.76    | 17.75 | 5.14       | 23.0        | 175  | 0.12              |
|  | 0920                         | 100        | 2.0         | 26.03                 | 2.75    | 17.81 | 5.15       | 22.7        | 174  | 0.12              |
|  | 0925                         | 100        | 2.5         | 26.05                 | 2.75    | 17.87 | 5.16       | 22.0        | 173  | 0.11              |
|  | 0930                         | 100        | 3.0         | 26.07                 | 2.75    | 17.93 | 5.17       | 21.3        | 172  | 0.11              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW05

Project No: 501032

Sampler(s): Scott Breesinger

## FIELD CONDITIONS

OVERCAST / RAIN

## SAMPLING INFORMATION

Sample No: 67WW05-181025-FDDATE/TIME: 10/25/18 / 0848Sample Interval: 25.80 - 26.07

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 0900Depth to Water - Initial (DTWi) (ft) 25.80Purge End Date/Time: 10/25/18 0930Depth to Well Bottom (ft) 30.20Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 20.00 - 30.00Discharge Tube Diameter: 1/4" Immersible Layer: Y (N)Approximate depth of pump inlet\*(ft): 28.00Pump Start Time: 0900



# Sample Collection Log

2 of 2

| Location ID: 67WW05      Sample No: 67WW05-1810 <del>25</del> -FD |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18  | 0905                         | 100        | .5          | 25.88                 | 2.89    | 17.16 | 5.09       | 79.5        | 191  | 0.67              |
|   | 0910                         | 100        | 1.0         | 25.95                 | 2.83    | 17.69 | 4.99       | 32.3        | 186  | 0.31              |
|   | 0915                         | 100        | 1.5         | 26.00                 | 2.76    | 17.75 | 5.14       | 23.0        | 175  | 0.12              |
|   | 0920                         | 100        | 2.0         | 26.03                 | 2.75    | 17.81 | 5.15       | 22.7        | 174  | 0.12              |
|   | 0925                         | 100        | 2.5         | 26.05                 | 2.75    | 17.87 | 5.16       | 22.0        | 173  | 0.11              |
|   | 0930                         | 100        | 3.0         | 26.07                 | 2.75    | 17.93 | 5.17       | 21.3        | 172  | 0.11              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW07

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Overcast

## SAMPLING INFORMATION

Sample No: 67WW07-181025DATE/TIME: 10/25/18 / 10:40Sample Interval: 24.94 25.19

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow/Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 1055Depth to Water - Initial (DTWi) (ft) 24.94Purge End Date/Time: 10/25/18 1125Depth to Well Bottom (ft) 28.00Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 17.85 - 28.85Discharge Tube Diameter: 1/4" Immersible Layer: Y ☒ NApproximate depth of pump inlet\* (ft): 19  
26.00Pump Start Time: 1055

1128

2ND Check Depth to well Bottom - 28.00





# Sample Collection Log

2 of 2

| Location ID: 67WW07 Sample No: 67WW07-1810 <u>25</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18   | 1100                         | 100        | 1.5         | 25.01                 | 3.79    | 17.51 | 5.52       | 111         | 160  | 0.57              |
|  | 1105                         | 100        | 1.0         | 25.08                 | 3.80    | 17.75 | 5.15       | 80.4        | 188  | 0.25              |
|  | 1110                         | 100        | 1.5         | 25.12                 | 3.80    | 17.76 | 5.02       | 67.3        | 197  | 0.11              |
|  | 1115                         | 100        | 2.0         | 25.15                 | 3.80    | 17.77 | 5.01       | 66.7        | 198  | 0.11              |
|  | 1120                         | 100        | 2.5         | 25.17                 | 3.80    | 17.78 | 5.01       | 66.1        | 199  | 0.10              |
|  | 1125                         | 100        | 3.0         | 25.19                 | 3.80    | 17.79 | 5.01       | 65.6        | 200  | 0.10              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW08

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy / Cool

## SAMPLING INFORMATION

Sample No: 67WW08-181023DATE/TIME: 10/23/18 / 0953Sample Interval 24.41 - 24.62

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses   | Container       | Preserv               |
|------------------|-------|-----------|--|-----------------|-----------------------|
|                  | ALSHT |           | Anions in Water by E300, Alkalinity in Water by E310.1 | 1 x 250 mL HDPE | Cool 4C               |
|                  |       |           | DHC in Water by CENSUS-qPCR                            | 1 x 1 L HDPE    | Cool 4C               |
|                  |       |           | Dissolved Gases in Water by RSK175                     | 3 x 40 mL Glass | Cool 4C               |
|                  |       |           | Sulfide in Water by E376.1                             | 1 x 500 mL HDPE | NaOH>pH12; 2N Zinc Ac |
|                  |       |           | TIC in Water by E415.1                                 | 2 x 40 mL Glass | Cool 4C               |
|                  |       |           | TOC in Water by E415.1                                 | 2 x 40 mL Amber | H2SO4                 |
|                  |       |           | VOCs in Water by 8260B                                 | 3 x 40 mL Glass | HCL<pH2               |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/23/18 1010Depth to Water - Initial (DTWi) (ft) 24.41Purge End Date/Time: 10/23/18 1045Depth to Well Bottom (ft) 52.45Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 26.96 - 51.46Discharge Tube Diameter: 1/4" Immersible Layer: Y (N)Approximate depth of pump inlet\* (ft): 39.21Pump Start Time: 1010

10:48  
2nd Check Depth to Bottom of Well - 52.45



# Sample Collection Log

2 of 2

| Location ID: 67WW08 Sample No: 67WW08-1810 <u>23</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18   | 1015                         | 100        | .5          | 24.48                 | 6.37    | 17.78 | 6.37       | 0.0         | 168  | 0.41              |
|  | 1020                         | 100        | 1.0         | 24.55                 | 6.35    | 17.95 | 6.34       | 0.0         | 159  | 0.22              |
|  | 1025                         | 100        | 1.5         | 24.58                 | 6.32    | 18.00 | 6.33       | 0.0         | 155  | 0.15              |
|  | 1030                         | 100        | 2.0         | 24.60                 | 6.30    | 18.05 | 6.33       | 0.0         | 153  | 0.09              |
|  | 1035                         | 100        | 2.5         | 24.61                 | 6.29    | 18.09 | 6.33       | 0.0         | 151  | 0.09              |
|  | 1040                         | 100        | 3.0         | 24.62                 | 6.29    | 18.12 | 6.33       | 0.0         | 150  | 0.08              |
|  | 1045                         | 100        | 3.5         | 24.62                 | 6.29    | 18.14 | 6.33       | 0.0         | 150  | 0.08              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW08

Project No: 501032

Sampler(s): Scott Bessinger

## FIELD CONDITIONS

cloudy / cool

## SAMPLING INFORMATION

Sample No: 67WW08-181023-FDDATE/TIME: 10/23/18 / 0953Sample Interval: 24.41 24.62

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses   | Container       | Preserv               |
|------------------|-------|-----------|--|-----------------|-----------------------|
|                  | ALSHT |           | Anions in Water by E300, Alkalinity in Water by E310.1 | 1 x 250 mL HDPE | Cool 4C               |
|                  |       |           | DHC in Water by CENSUS-qPCR                            | 1 x 1 L HDPE    | Cool 4C               |
|                  |       |           | Dissolved Gases in Water by RSK175                     | 3 x 40 mL Glass | Cool 4C               |
|                  |       |           | Sulfide in Water by E376.1                             | 1 x 500 mL HDPE | NaOH>pH12; 2N Zinc Ac |
|                  |       |           | TIC in Water by E415.1                                 | 2 x 40 mL Glass | Cool 4C               |
|                  |       |           | TOC in Water by E415.1                                 | 2 x 40 mL Amber | H2SO4                 |
|                  |       |           | VOCs in Water by 8260B                                 | 3 x 40 mL Glass | HCL<pH2               |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow / BLADDER PUMPCasing ID (in.): 4Purge Start Date/Time: 10/23/18 10:10Depth to Water - Initial (DTWi) (ft) 24.41Purge End Date/Time: 10/23/18 1045Depth to Well Bottom (ft) 52.45Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 26.96 - 51.46Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\*(ft): 35.05  
39.21Pump Start Time: 10 10





# Sample Collection Log

2 of 2

| Location ID: 67WW08      Sample No: 67WW08-181023FD |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                     | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18  | 1015                         | 100        | .5          | 24.48                 | 6.37    | 17.78 | 6.37       | 0.0         | 168  | 0.41              |
|   | 1020                         | 100        | 1.0         | 24.55                 | 6.35    | 17.95 | 6.34       | 0.0         | 159  | 0.22              |
|   | 1025                         | 100        | 1.5         | 24.58                 | 6.32    | 18.00 | 6.33       | 0.0         | 155  | 0.15              |
|   | 1030                         | 100        | 2.0         | 24.60                 | 6.30    | 18.05 | 6.33       | 0.0         | 153  | 0.09              |
|   | 1035                         | 100        | 2.5         | 24.61                 | 6.29    | 18.09 | 6.33       | 0.0         | 151  | 0.09              |
|   | 1040                         | 100        | 3.0         | 24.62                 | 6.29    | 18.12 | 6.33       | 0.0         | 150  | 0.08              |
|   | 1045                         | 100        | 3.5         | 24.62                 | 6.29    | 18.14 | 6.33       | 0.0         | 150  | 0.08              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



APTIM

Project Name: Longhorn AAP

Project No: 501032

## Sample Collection Log

1 of 2

Location ID: 67WW09

Sampler(s): Scott Breesinger

## FIELD CONDITIONS

Cloudy / Cool

## SAMPLING INFORMATION

Sample No: 67WW09-181023DATE/TIME: 10/23/18 /  
1204Sample Interval: 22.43 - 22.65

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingCasing ID (in.): 4Depth to Water - Initial (DTWi) (ft) 22.43Depth to Well Bottom (ft) ~~33.5~~ 38.00Screen Interval (ft): 17.43 - 37.43Approximate depth of pump inlet\* (ft): ~~24.25~~  
27.43Purging Method/Equipment: Low flow/BLADDER PumpPurge Start Date/Time: 10/23/18 1215Purge End Date/Time: 10/23/18 1245Discharge Tube Length: NA PID Reading: NADischarge Tube Diameter: 1/4" Immersible Layer: Y / NPump Start Time: 121512:482ND CHECK Depth to well Bottom - 38.00



# Sample Collection Log

2 of 2

| Location ID: 67WW09      Sample No: 67WW09-1810 <u>23</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18  | 1220                         | 100        | 1.5         | 22.50                 | 3.37    | 18.55 | 6.36       | 8.7         | 215  | 0.59              |
|   | 1225                         | 100        | 1.0         | 22.56                 | 3.37    | 18.60 | 6.34       | 3.3         | 210  | 0.23              |
|   | 1230                         | 100        | 1.5         | 22.60                 | 3.36    | 18.64 | 6.24       | 1.2         | 205  | 0.11              |
|   | 1235                         | 100        | 2.0         | 22.62                 | 3.35    | 18.68 | 6.23       | 0.7         | 204  | 0.11              |
|   | 1240                         | 100        | 2.5         | 22.64                 | 3.35    | 18.71 | 6.23       | 0.0         | 204  | 0.10              |
| ✓   | 1245                         | 100        | 3.0         | 22.65                 | 3.35    | 18.75 | 6.23       | 0.0         | 203  | 0.10              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





APTIM

Project Name: Longhorn AAP

Project No: 501032

## Sample Collection Log

1 of 2

Location ID: 67WW09A

Sampler(s): Scott Beers, NGAR

## FIELD CONDITIONS

OVERCAST

## SAMPLING INFORMATION

Sample No: 67WW09A-181025DATE/TIME: 10/25/18 / 1144Sample Interval: 27.02 27.26

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Lowflow / BLADDER PumpCasing ID (in.): 2"Purge Start Date/Time: 10/25/18 1155Depth to Water - Initial (DTWi) (ft) 27.02Purge End Date/Time: 10/25/18 1225Depth to Well Bottom (ft) 38.71Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80-37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\* (ft): 28.15Pump Start Time: 115530.15

1238  
2nd check Depth to Well Bottom - 38.71





# Sample Collection Log

2 of 2

| Location ID: 67WW09A      Sample No: 67WW09A-1810 <u>25</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18  | 1200                         | 100        | .5          | 27.10                 | 2.85    | 17.39 | 6.18       | 1.4         | 128  | 0.55              |
|   | 1205                         | 100        | 1.0         | 27.16                 | 3.16    | 17.64 | 6.10       | 0.0         | 150  | 0.23              |
|   | 1210                         | 100        | 1.5         | 27.20                 | 3.24    | 17.69 | 6.05       | 0.0         | 140  | 0.06              |
|   | 1215                         | 100        | 2.0         | 27.23                 | 3.25    | 17.72 | 6.05       | 0.0         | 139  | 0.06              |
|   | 1220                         | 100        | 2.5         | 27.25                 | 3.26    | 17.75 | 6.04       | 0.0         | 139  | 0.06              |
|   | 1225                         | 100        | 3.0         | 27.26                 | 3.26    | 17.79 | 6.04       | 0.0         | 138  | 0.05              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09A

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Overcast

## SAMPLING INFORMATION

Sample No: 67WW09A-1810 25-MSDATE/TIME: 10/25/18 / 1144Sample Interval: 27.02 27.26

Sampling Method:

Sample Purpose: MS

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Lowflow / BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/25/18 1155Depth to Water - Initial (DTWi) (ft) 27.02Purge End Date/Time: 10/25/18 1225Depth to Well Bottom (ft) 38.71Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80 - 37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\*(ft): 26.8 30.15Pump Start Time: 1225



# Sample Collection Log

2 of 2

| Location ID: 67WW09A Sample No: 67WW09A-181025-MS |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18  | 1200                         | 100        | .5          | 27.10                 | 2.85    | 17.39 | 6.18       | 1.4         | 128  | 0.55              |
|   | 1205                         | 100        | 1.0         | 27.16                 | 3.16    | 17.64 | 6.10       | 0.0         | 150  | 0.23              |
|   | 1210                         | 100        | 1.5         | 27.20                 | 3.24    | 17.69 | 6.05       | 0.0         | 140  | 0.06              |
|   | 1215                         | 100        | 2.0         | 27.23                 | 3.25    | 17.72 | 6.05       | 0.0         | 139  | 0.06              |
|   | 1220                         | 100        | 2.5         | 27.25                 | 3.26    | 17.75 | 6.04       | 0.0         | 139  | 0.06              |
|   | 1225                         | 100        | 3.0         | 27.26                 | 3.26    | 17.79 | 6.04       | 0.0         | 138  | 0.05              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09A

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

OVERCAST

## SAMPLING INFORMATION

Sample No: 67WW09A-1810 25 -MSDDATE/TIME: 10/25/18 / 11:44Sample Interval: 27.02 27.26

Sampling Method:

Sample Purpose: MSD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 11:55Depth to Water - Initial (DTWi) (ft) 27.02Purge End Date/Time: 10/25/18 12:25Depth to Well Bottom (ft) 38.71Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80 - 37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\* (ft): 28.45  
30.15Pump Start Time: 12:25



# Sample Collection Log

2 of 2

| Location ID: 67WW09A Sample No: 67WW09A-1810 <u>25</u> -MSD |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18  | 1200                         | 100        | .5          | 27.10                 | 2.85    | 17.39 | 6.18       | 1.4         | 128  | 0.55              |
|   | 1205                         | 100        | 1.0         | 27.16                 | 3.16    | 17.64 | 6.10       | 0.0         | 150  | 0.23              |
|   | 1210                         | 100        | 1.5         | 27.20                 | 3.24    | 17.69 | 6.05       | 0.0         | 140  | 0.06              |
|   | 1215                         | 100        | 2.0         | 27.23                 | 3.25    | 17.72 | 6.05       | 0.0         | 139  | 0.06              |
|   | 1220                         | 100        | 2.5         | 27.25                 | 3.26    | 17.75 | 6.04       | 0.0         | 139  | 0.06              |
|   | 1225                         | 100        | 3.0         | 27.26                 | 3.26    | 17.79 | 6.04       | 0.0         | 138  | 0.05              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW10

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Clear / Sunny

## SAMPLING INFORMATION

Sample No: 67WW10-181022DATE/TIME: 10/22/18 /  
1355Sample Interval: 25.65 - 25.88

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/22/18 1405Depth to Water - Initial (DTWi) (ft) 25.65Purge End Date/Time: 10/22/18 1435Depth to Well Bottom (ft) 50.90Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 18.70 - 50.20Discharge Tube Diameter: 1/4" Immersible Layer: Y (N)Approximate depth of pump inlet\* (ft): 34.45Pump Start Time: 1405

1438  
2ND CHECK Depth to well Bottom - 50.90





# Sample Collection Log

2 of 2

| Location ID: 67WW10 Sample No: 67WW10-1810 <u>22</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/22/18   | 1410                         | 100        | 1.5         | 25.73                 | 5.17    | 18.83 | 5.72       | 32.5        | 168  | 0.98              |
|  | 1415                         | 100        | 1.0         | 25.80                 | 5.18    | 18.71 | 5.53       | 34.0        | 179  | 0.41              |
|  | 1420                         | 100        | 1.5         | 25.83                 | 5.18    | 18.65 | 5.52       | 33.4        | 179  | 0.19              |
|  | 1425                         | 100        | 2.0         | 25.85                 | 5.18    | 18.61 | 5.51       | 32.5        | 178  | 0.19              |
|  | 1430                         | 100        | 2.5         | 25.87                 | 5.17    | 18.57 | 5.51       | 31.9        | 178  | 0.18              |
|  | 1435                         | 100        | 3.0         | 25.88                 | 5.17    | 18.54 | 5.51       | 31.2        | 178  | 0.18              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW11

Project No: 501032

Sampler(s): Scott Bessinger

## FIELD CONDITIONS

Cloudy / cool

## SAMPLING INFORMATION

Sample No: 67WW11-181023DATE/TIME: 10/23/18 / 10/14Sample Interval: 23.45 24.20

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 10/23/18 1125Depth to Water - Initial (DTWi) (ft) 23.95Purge End Date/Time: 10/23/18 1155Depth to Well Bottom (ft) ~~45.5~~ 47.05Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 21.75 - 46.25Discharge Tube Diameter: 1/4" Immersible Layer: Y ☒ NApproximate depth of pump inlet\*(ft): ~~32.75~~Pump Start Time: 112534.0011:582nd CHECK Depth to Well Bottom - 47.05



# Sample Collection Log

2 of 2

| Location ID: 67WW11      Sample No: 67WW11-1810 <u>23</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18  | 1130                         | 100        | 1.5         | 24.03                 | 5.00    | 17.77 | 6.52       | 9.3         | 213  | 0.55              |
|   | 1135                         | 100        | 1.0         | 24.10                 | 4.99    | 18.02 | 6.48       | 4.1         | 181  | 0.21              |
|   | 1140                         | 100        | 1.5         | 24.14                 | 4.99    | 18.02 | 6.45       | 1.9         | 171  | 0.07              |
|   | 1145                         | 100        | 2.0         | 24.18                 | 4.98    | 18.03 | 6.45       | 0.6         | 170  | 0.07              |
|   | 1150                         | 100        | 2.5         | 24.18                 | 4.98    | 18.04 | 6.45       | 0.0         | 169  | 0.06              |
|   | 1155                         | 100        | 3.0         | 24.20                 | 4.98    | 18.05 | 6.45       | 0.0         | 168  | 0.06              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW12

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Clear / Sunny

## SAMPLING INFORMATION

Sample No: 67WW12-181022DATE/TIME: 10/22/18 /  
1305Sample Interval: 26.30 - 26.55

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv   |
|------------------|-------|-----------|------------------------|-----------------|-----------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL < pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low Flow / Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 10/22/18 1315Depth to Water - Initial (DTWi) (ft) 26.30Purge End Date/Time: 10/22/18 1345Depth to Well Bottom (ft) 37.08Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 26.96 - 36.46Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\* (ft): 26.75  
31.71Pump Start Time: 1315

13:47  
 2ND CHECK Depth of well Bottom = 37.08





# Sample Collection Log

2 of 2

| Location ID: 67WW12      Sample No: 67WW12-1810 <u>22</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/24/18  | 1320                         | 100        | .5          | 26.38                 | 3.99    | 19.24 | 6.02       | 0.0         | 188  | 0.94              |
| ↓   | 1325                         | 100        | 1.0         | 26.45                 | 4.65    | 18.90 | 5.57       | 0.0         | 235  | 0.51              |
| ↓   | 1330                         | 100        | 1.5         | 26.48                 | 5.23    | 18.86 | 5.65       | 0.0         | 212  | 0.31              |
| ↓   | 1335                         | 100        | 2.0         | 26.51                 | 5.23    | 18.83 | 5.66       | 0.0         | 211  | 0.30              |
| ↓   | 1340                         | 100        | 2.5         | 26.53                 | 5.24    | 18.80 | 5.67       | 0.0         | 210  | 0.29              |
| ↓   | 1345                         | 100        | 3.0         | 26.55                 | 5.24    | 18.77 | 5.68       | 0.0         | 209  | 0.29              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW13

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy / COOL

## SAMPLING INFORMATION

Sample No: 67WW13-181023DATE/TIME: 10/23/18 / 0851Sample Interval: ~~22.38~~ 22.62

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses   | Container       | Preserv               |
|------------------|-------|-----------|--|-----------------|-----------------------|
|                  | ALSHT |           | Anions in Water by E300, Alkalinity in Water by E310.1 | 1 x 250 mL HDPE | Cool 4C               |
|                  |       |           | DHC in Water by CENSUS-qPCR                            | 1 x 1 L HDPE    | Cool 4C               |
|                  |       |           | Dissolved Gases in Water by RSK175                     | 3 x 40 mL Glass | Cool 4C               |
|                  |       |           | Sulfide in Water by E376.1                             | 1 x 500 mL HDPE | NaOH>pH12; 2N Zinc Ac |
|                  |       |           | TIC in Water by E415.1                                 | 2 x 40 mL Glass | Cool 4C               |
|                  |       |           | TOC in Water by E415.1                                 | 2 x 40 mL Amber | H2SO4                 |
|                  |       |           | VOCs in Water by 8260B                                 | 3 x 40 mL Glass | HCL<pH2               |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/23/18 0905Depth to Water - Initial (DTWi) (ft) 22.38Purge End Date/Time: 10/23/18 0935Depth to Well Bottom (ft) ~~28.75~~ 28.75Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 13.40-28.10Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\*(ft): ~~17.00~~ 25.00Pump Start Time: 0905

0938  
~~2nd~~ 2nd Check Depth to Bottom of well - 28.75



# Sample Collection Log

2 of 2

| Location ID: 67WW13 Sample No: 67WW13-1810 <u>22</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18   | 0910                         | 100        | 1.5         | 22.45                 | 5.40    | 17.87 | 6.20       | 0.0         | 258  | 0.97              |
|  | 0915                         | 100        | 1.0         | 22.51                 | 5.40    | 18.37 | 5.88       | 0.0         | 278  | 0.40              |
|  | 0920                         | 100        | 1.5         | 22.55                 | 5.40    | 18.39 | 5.80       | 0.0         | 279  | 0.20              |
|  | 0925                         | 100        | 2.0         | 22.58                 | 5.39    | 18.43 | 5.79       | 0.0         | 280  | 0.20              |
|  | 0930                         | 100        | 2.5         | 22.60                 | 5.39    | 18.47 | 5.78       | 0.0         | 280  | 0.19              |
|  | 0935                         | 100        | 3.0         | 22.62                 | 5.39    | 18.44 | 5.78       | 0.0         | 281  | 0.19              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW14

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Clear / Sunny

## SAMPLING INFORMATION

Sample No: 67WW14-1810 22DATE/TIME: 10/22/18 / 1214Sample Interval: 20.85 - 21.08

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 2

Purge Start Date/Time: 10/22/18 1225Depth to Water - Initial (DTWi) (ft) 20.85Purge End Date/Time: 10/22/18 1255Depth to Well Bottom (ft) ~~20.85~~ 30.47Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 20.40-30.40Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\*(ft): ~~10.5~~ 25.40Pump Start Time: 1225

12:55  
2nd check Depth to well Bottom - 30.47





# Sample Collection Log

2 of 2

| Location ID: 67WW14      Sample No: 67WW14-1810 <u>22</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/22/18  | 1230                         | 100        | .5          | 20.93                 | 2.22    | 21.07 | 5.71       | 40.1        | 251  | 1.21              |
|   | 1235                         | 100        | 1.0         | 20.98                 | 2.17    | 21.74 | 5.71       | 12.9        | 275  | 0.87              |
|   | 1240                         | 100        | 1.5         | 21.02                 | 2.10    | 21.72 | 5.74       | 3.2         | 275  | 0.69              |
|   | 1245                         | 100        | 2.0         | 21.04                 | 2.10    | 21.70 | 5.75       | 1.9         | 274  | 0.68              |
|   | 1250                         | 100        | 2.5         | 21.06                 | 2.09    | 21.69 | 5.75       | 0.7         | 274  | 0.67              |
|   | 1255                         | 100        | 3.0         | 21.08                 | 2.09    | 21.68 | 5.76       | 0.0         | 274  | 0.66              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW15

Project No: 501032

Sampler(s): Scott Beasinger

## FIELD CONDITIONS

Cloudy / Cool

## SAMPLING INFORMATION

Sample No: 67WW15-181023DATE/TIME: 10/23/18 /  
1255Sample Interval: 24.23-24.44

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: low flow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/23/18 1305Depth to Water - Initial (DTWi) (ft) 24.23Purge End Date/Time: 10/23/18 1335Depth to Well Bottom (ft) 47.59Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 37.53 - 47.23Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\*(ft): ~~30.25~~ 42.38Pump Start Time: 130513:38AND CHECK Depth of Well Bottom - 47.59



# Sample Collection Log

2 of 2

| Location ID: 67WW15      Sample No: 67WW15-1810 <u>23</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/23/18  | 1310                         | 100        | 1.5         | 24.30                 | 1.81    | 17.83 | 5.85       | 10.3        | 249  | 0.46              |
|   | 1315                         | 100        | 1.0         | 24.36                 | 1.80    | 18.02 | 5.64       | 6.9         | 252  | 0.29              |
|   | 1320                         | 100        | 1.5         | 24.39                 | 1.80    | 18.03 | 5.63       | 4.0         | 252  | 0.17              |
|   | 1325                         | 100        | 2.0         | 24.41                 | 1.80    | 18.04 | 5.62       | 3.2         | 253  | 0.17              |
|   | 1330                         | 100        | 2.5         | 24.43                 | 1.80    | 18.05 | 5.61       | 2.5         | 253  | 0.17              |
|   | 1335                         | 100        | 3.0         | 24.44                 | 1.80    | 18.06 | 5.61       | 2.1         | 253  | 0.16              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW161

Project No: 501032

Sampler(s): Scott Buesinger

## FIELD CONDITIONS

OVERCAST

## SAMPLING INFORMATION

Sample No: 67WW161-1810 25DATE/TIME: 10/25/18 / 1037Sample Interval: 24.03 24.22

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | Lab   | COC Notes | Analyses               | Container       | Preserv |
|------------------|-------|-----------|------------------------|-----------------|---------|
|                  | ALSHT |           | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Lowflow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 10/25/18 1250Depth to Water - Initial (DTWi) (ft) 24.03Purge End Date/Time: 10/25/18 1320Depth to Well Bottom (ft) 80.49Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 70.43 - 80.13Discharge Tube Diameter: 1/4" Immersible Layer: Y/NApproximate depth of pump inlet\*(ft): 75.28Pump Start Time: 1250

1323  
2nd check Depth to well Bottom - 80.49



# Sample Collection Log

2 of 2

| Location ID: 67WW16I Sample No: 67WW16I-1810 <u>25</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading  | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 10/25/18   | 1255                         | 100        | .5          | 24.08                 | 1.47    | 17.22 | 6.35       | 5.9         | 56   | 0.49              |
|  | 1300                         | 100        | 1.0         | 24.12                 | 1.53    | 17.59 | 6.25       | 7.1         | 42   | 0.23              |
|  | 1305                         | 100        | 1.5         | 24.16                 | 1.53    | 17.61 | 6.24       | 7.4         | 42   | 0.15              |
|  | 1310                         | 100        | 2.0         | 24.19                 | 1.53    | 17.63 | 6.24       | 7.9         | 41   | 0.15              |
|  | 1315                         | 100        | 2.5         | 24.21                 | 1.53    | 17.66 | 6.24       | 7.8         | 41   | 0.15              |
|  | 1320                         | 100        | 3.0         | 24.22                 | 1.53    | 17.69 | 6.24       | 7.6         | 41   | 0.14              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW01

Project No: 501032

Sampler(s): Scott Beersinger

## FIELD CONDITIONS

CLEAR / Sunny

## SAMPLING INFORMATION

Sample No: 67WW01-190503

DATE/TIME: 5/3/19 / 0730

Sample Interval: 22.97 23.23

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow Bladder Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/3/19 0740

Depth to Water - Initial (DTWi) (ft) 22.97

Purge End Date/Time: 5/3/19 0810

Depth to Well Bottom (ft) 27.03

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 17.00 - 27.00

Discharge Tube Diameter: 1/4" Immersible Layer: Y (N)

Approximate depth of pump inlet\* (ft): 24.00

Pump Start Time: 0740

Ferrous Iron (Required Y or N) mg/L

2ND DTW prepurge - 22.97





# Sample Collection Log

2 of 2

| Location ID: 67WW01 Sample No: 67WW01-1905 <u>03</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/3/19   | 0745                         | 100        | 1.5         | 23.06                 | 3.64    | 21.13 | 6.06       | 149         | 230  | 1.43              |
|  | 0750                         | 100        | 1.0         | 23.12                 | 3.64    | 20.11 | 6.44       | 120         | 216  | 0.77              |
|  | 0755                         | 100        | 1.5         | 23.16                 | 3.66    | 20.01 | 6.20       | 103         | 203  | 0.49              |
|  | 0800                         | 100        | 2.0         | 23.19                 | 3.67    | 19.94 | 6.19       | 102         | 203  | 0.48              |
|  | 0805                         | 100        | 2.5         | 23.21                 | 3.67    | 19.87 | 6.18       | 101         | 202  | 0.47              |
|  | 0810                         | 100        | 3.0         | 23.23                 | 3.67    | 19.81 | 6.17       | 100         | 202  | 0.46              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW02

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

cloudy

## SAMPLING INFORMATION

Sample No: 67WW02-190501

DATE/TIME: 5/1/19 / 1056

Sample Interval: 22.42 - 22.67

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv   |
|------------------|-----------|-------|------------------------|-----------------|-----------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL < pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/1/19 1105

Depth to Water - Initial (DTWi) (ft) 22.42

Purge End Date/Time: 5/1/19 1135

Depth to Well Bottom (ft) 27.80

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 18-28 SS ~~17.00 - 27.00~~

Discharge Tube Diameter: 1/4" Immersible Layer: Y (N)

Approximate depth of pump inlet\* (ft): 24.00

Pump Start Time: 1105

Ferrous Iron (Required Y or N) (N) \_\_\_\_\_ mg/L

and DTW pre-purge - 22.42



# Sample Collection Log

2 of 2

| Location ID: 67WW02      Sample No: 67WW02-19050 |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                  | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19   | 1110                         | 100        | .5          | 22.50                 | 4.02    | 23.40 | 5.75       | 15.0        | 18   | 1.21              |
|  | 1115                         | 100        | 1.0         | 22.56                 | 4.03    | 23.67 | 5.78       | 6.7         | 57   | 0.51              |
|  | 1120                         | 100        | 1.5         | 22.60                 | 4.03    | 23.77 | 5.76       | 3.1         | 70   | 0.29              |
|  | 1125                         | 100        | 2.0         | 22.63                 | 4.03    | 23.85 | 5.75       | 1.5         | 71   | 0.28              |
|  | 1130                         | 100        | 2.5         | 22.65                 | 4.03    | 23.92 | 5.75       | 0.8         | 72   | 0.27              |
|  | 1135                         | 100        | 3.0         | 22.67                 | 4.03    | 24.00 | 5.74       | 0.0         | 73   | 0.27              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW02

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW02-190501-FDDATE/TIME: 5/1/19 / 1056Sample Interval: 22.42 22.67

Sampling Method:

Sample Purpose: FDSample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Lowflow/Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 1105Depth to Water - Initial (DTWi) (ft) 22.42Purge End Date/Time: 5/1/19 1135Depth to Well Bottom (ft) 27.80Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 7.00 27.00Discharge Tube Diameter: 1/4" Immersible Layer: Y / DApproximate depth of pump inlet\* (ft): 24.00Pump Start Time: 1105Ferrous Iron (Required Y or N) \_\_\_\_\_ mg/L



# Sample Collection Log

2 of 2

| Location ID: 67WW02      Sample No: 67WW02-190501-FD |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19   | 1110                         | 100        | .5          | 22.50                 | 4.02    | 23.40 | 5.75       | 15.0        | 18   | 1.21              |
|  | 1115                         | 100        | 1.0         | 22.56                 | 4.03    | 23.67 | 5.78       | 6.7         | 57   | 0.51              |
|  | 1120                         | 100        | 1.5         | 22.60                 | 4.03    | 23.77 | 5.76       | 3.1         | 70   | 0.29              |
|  | 1125                         | 100        | 2.0         | 22.63                 | 4.03    | 23.85 | 5.75       | 1.5         | 71   | 0.28              |
|  | 1130                         | 100        | 2.5         | 22.65                 | 4.03    | 23.92 | 5.75       | 0.8         | 72   | 0.27              |
|  | 1135                         | 100        | 3.0         | 22.67                 | 4.03    | 24.00 | 5.74       | 0.0         | 73   | 0.27              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW03

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW03-190502DATE/TIME: 5/2/19 / 1015

Sample Interval: \_\_\_\_ - \_\_\_\_

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: NACasing ID (in.): 4Purge Start Date/Time: NADepth to Water - Initial (DTWi) (ft) DryPurge End Date/Time: NADepth to Well Bottom (ft) 24.90Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 14.80 - 24.80Discharge Tube Diameter: NA Immersible Layer: Y / NApproximate depth of pump inlet\* (ft): 24Pump Start Time: NAFerrous Iron (Required Y or N) \_\_\_\_\_ mg/L



## 2 of 2

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW05

Project No: 501032

Sampler(s): Scott Buesinger

## FIELD CONDITIONS

Cloudy / LIGHT RAIN

## SAMPLING INFORMATION

Sample No: 67WW05-190502DATE/TIME: 5/2/19 / 0923Sample Interval: 24.46 24.68

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv   |
|------------------|-----------|-------|------------------------|-----------------|-----------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL < pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/2/19 0935Depth to Water - Initial (DTWi) (ft) 24.46Purge End Date/Time: 5/2/19 1005Depth to Well Bottom (ft) 30.13Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 20.00 - 30.00Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\* (ft): 26.00Pump Start Time: 0935Ferrous Iron (Required Y or (N)) \_\_\_\_\_ mg/L

AND DTW pre-purge - 24.46



# Sample Collection Log

2 of 2

| Location ID: 67WW05 Sample No: 67WW05-1905 <u>02</u> |                              |            |             |                       |         |       |            |                 |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-----------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity       | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)           | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria     |      | ± 10% or 0.2 mg/L |
| 5/2/19   | 0940                         | 100        | 1.5         | 24.53                 | 2.60    | 20.53 | 5.30       | <del>64.5</del> | 183  | 2.83              |
|  | 0945                         | 100        | 1.0         | 24.59                 | 2.62    | 20.23 | 4.80       | 59.3            | 219  | 2.59              |
|  | 0950                         | 100        | 1.5         | 24.62                 | 2.64    | 20.20 | 4.13       | 56.9            | 244  | 2.05              |
|  | 0955                         | 100        | 2.0         | 24.64                 | 2.65    | 20.17 | 4.12       | 56.3            | 245  | 2.03              |
|  | 1000                         | 100        | 2.5         | 24.66                 | 2.65    | 20.14 | 4.11       | 55.7            | 246  | 2.01              |
|  | 1005                         | 100        | 3.0         | 24.68                 | 2.65    | 20.10 | 4.11       | 55.2            | 247  | 1.99              |
|  |                              |            |             |                       |         |       |            |                 |      |                   |
|  |                              |            |             |                       |         |       |            |                 |      |                   |
|  |                              |            |             |                       |         |       |            |                 |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW07

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Clear/sunny

## SAMPLING INFORMATION

Sample No: 67WW07-190503DATE/TIME: 5/3/19 / 1000Sample Interval 21.72 - 21.95

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low Flow/Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 5/3/19 1005Depth to Water - Initial (DTWi) (ft) 21.72Purge End Date/Time: 5/3/19 1035Depth to Well Bottom (ft) 27.88Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 17.85 - 27.85Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\* (ft): 22.85Pump Start Time: 1005Ferrous Iron (Required Y or (N)) \_\_\_\_\_ mg/L

2ND DTW pre-purge - 21.72





# Sample Collection Log

2 of 2

| Location ID: 67WW07 Sample No: 67WW07-1905 <u>03</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/3/19   | 1010                         | 100        | .5          | 21.80                 | 3.68    | 20.72 | 5.96       | 50.7        | 200  | 0.65              |
|  | 1015                         | 100        | 1.0         | 21.86                 | 3.69    | 20.33 | 5.29       | 35.3        | 228  | 0.16              |
|  | 1020                         | 100        | 1.5         | 21.90                 | 3.70    | 20.31 | 5.07       | 32.9        | 246  | 0.07              |
|  | 1025                         | 100        | 2.0         | 21.92                 | 3.70    | 20.29 | 5.06       | 32.3        | 247  | 0.07              |
|  | 1030                         | 100        | 2.5         | 21.94                 | 3.70    | 20.27 | 5.06       | 31.8        | 248  | 0.06              |
|  | 1035                         | 100        | 3.0         | 21.95                 | 3.70    | 20.26 | 5.05       | 31.4        | 249  | 0.07              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW08

Project No: 501032

Sampler(s): Scott Buesinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW08-190501DATE/TIME: 5/1/19 / 0822Sample Interval: 21.67-21.90

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses                           | Container       | Preserv |
|------------------|-----------|-------|------------------------------------|-----------------|---------|
|                  |           | ALSHT | Anions in Water by 9056            | 1 x 250 mL HDPE | Cool 4C |
|                  |           | ALSHT | Carbon Dioxide in Water by RSK175  | 3 x 40 mL Glass | Cool 4C |
|                  |           | ALSHT | Dissolved Gases in Water by RSK175 | 3 x 40 mL Glass | HCL<pH2 |
|                  |           | ALSHT | TOC in Water by SM5310C            | 2 x 40 mL Amber | H2SO4   |
|                  |           | ALSHT | VOCs in Water by 8260B             | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of CasingPurging Method/Equipment: Low flow / Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 0830Depth to Water - Initial (DTWi) (ft) 21.67Purge End Date/Time: 5/1/19 0900Depth to Well Bottom (ft) 51.95Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 26.96-51.46Discharge Tube Diameter: 1/4" Immersible Layer: Y / ☒ NApproximate depth of pump inlet\* (ft): 39.21Pump Start Time: 0830Ferrous Iron (Required) ☒ Yes 0.21 mg/L2ND DTW pre-purge - 21.67





# Sample Collection Log

2 of 2

| Location ID: 67WW08      Sample No: 67WW08-190501 |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19  | 0835                         | 100        | .5          | 21.75                 | 6.48    | 20.67 | 6.10       | 0.0         | 146  | 0.73              |
|   | 0840                         | 100        | 1.0         | 21.81                 | 6.84    | 20.48 | 5.95       | 0.0         | 135  | 0.18              |
|   | 0845                         | 100        | 1.5         | 21.85                 | 6.30    | 20.47 | 5.85       | 0.0         | 137  | 0.09              |
|   | 0850                         | 100        | 2.0         | 21.88                 | 6.29    | 20.46 | 5.84       | 0.0         | 137  | 0.09              |
|   | 0855                         | 100        | 2.5         | 21.90                 | 6.28    | 20.45 | 5.83       | 0.0         | 138  | 0.08              |
|   | 0900                         | 100        | 3.0         | 21.90                 | 6.28    | 20.44 | 5.82       | 0.0         | 138  | 0.08              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09

Project No: 501032

Sampler(s): Scott Blasinger

## FIELD CONDITIONS

CLEAR / SUNNY

## SAMPLING INFORMATION

Sample No: 67WW09-190503

DATE/TIME: 5/3/19 / 0914

Sample Interval: 19.83 - 20.06

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow BLADDER Pump

Casing ID (in.): 4

Purge Start Date/Time: 5/3/19 0920

Depth to Water - Initial (DTWi) (ft) 19.83

Purge End Date/Time: 5/3/19 0950

Depth to Well Bottom (ft) ~~34.5~~ 37.88

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 17.43 - 37.43

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

Approximate depth of pump inlet\* (ft): ~~24.25~~ 27.43

Pump Start Time: 0920

Ferrous Iron (Required Y or N) ☒ mg/L

2ND DTW PRE-PURGE - 19.83



# Sample Collection Log

2 of 2

| Location ID: 67WW09 Sample No: 67WW09-190503 |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                              | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/3/19                                       | 0925                         | 100        | .5          | 19.91                 | 3.45    | 20.41 | 6.26       | 3.9         | 216  | 1.06              |
| ↓  | 0930                         | 100        | 1.0         | 19.96                 | 3.48    | 20.17 | 5.55       | 1.4         | 240  | 0.43              |
| ↓  | 0935                         | 100        | 1.5         | 20.00                 | 3.48    | 20.14 | 5.37       | 0.5         | 249  | 0.13              |
| ↓  | 0940                         | 100        | 2.0         | 20.03                 | 3.49    | 20.10 | 5.36       | 0.0         | 250  | 0.14              |
| ↓  | 0945                         | 100        | 2.5         | 20.05                 | 3.49    | 20.07 | 5.36       | 0.0         | 250  | 0.13              |
| ↓  | 0950                         | 100        | 3.0         | 20.06                 | 3.49    | 20.04 | 5.36       | 0.0         | 250  | 0.13              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09A

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW09A-190502DATE/TIME: 5/2/19 / 1155Sample Interval 24.35-24.58

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: low flow/bladder pumpCasing ID (in.): 4Purge Start Date/Time: 5/2/19 1205Depth to Water - Initial (DTWi) (ft) 24.35Purge End Date/Time: 5/2/19 1235Depth to Well Bottom (ft) 38.77Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80-37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\* (ft): 30.15Pump Start Time: 1205Ferrous Iron (Required Y or N) N mg/L2ND DTW PRE-PURGE - 24.35



# Sample Collection Log

2 of 2

| Location ID: 67WW09A Sample No: 67WW09A-1905 <u>02</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading  | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/2/19   | 1210                         | 100        | .5          | 24.42                 | 3.41    | 21.20 | 6.47       | 30.3        | 95   | 0.94              |
|  | 1215                         | 100        | 1.0         | 24.47                 | 3.37    | 20.77 | 6.03       | 24.1        | 120  | 0.31              |
|  | 1220                         | 100        | 1.5         | 24.51                 | 3.40    | 20.75 | 6.00       | 23.7        | 121  | 0.10              |
|  | 1225                         | 100        | 2.0         | 24.54                 | 3.41    | 20.78 | 6.00       | 23.9        | 122  | 0.09              |
|  | 1230                         | 100        | 2.5         | 24.56                 | 3.42    | 20.82 | 6.00       | 24.2        | 123  | 0.09              |
|  | 1235                         | 100        | 3.0         | 24.58                 | 3.42    | 20.80 | 6.00       | 24.0        | 123  | 0.09              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09A

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

cloudy

## SAMPLING INFORMATION

Sample No: 67WW09A-1905 02-MSDATE/TIME: 5/2/19 / 1155Sample Interval: 24.35-24.58

Sampling Method:

Sample Purpose: MS

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/2/19 1205Depth to Water - Initial (DTWi) (ft) 24.35Purge End Date/Time: 5/2/19 1235Depth to Well Bottom (ft) 38.77Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80-37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\* (ft): 28.75 30.15Pump Start Time: 1205Ferrous Iron (Required Y or N) \_\_\_\_\_ mg/L





# Sample Collection Log

2 of 2

| Location ID: 67WW09A Sample No: 67WW09A-1905 <u>02-MS</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/2/19  | 1210                         | 100        | .5          | 24.42                 | 3.41    | 21.20 | 6.47       | 30.3        | 95   | 0.94              |
|   | 1215                         | 100        | 1.0         | 24.47                 | 3.37    | 20.77 | 6.03       | 24.1        | 120  | 0.31              |
|   | 1220                         | 100        | 1.5         | 24.51                 | 3.40    | 20.75 | 6.00       | 23.7        | 121  | 0.10              |
|   | 1225                         | 100        | 2.0         | 24.54                 | 3.41    | 20.78 | 6.00       | 23.9        | 122  | 0.09              |
|   | 1230                         | 100        | 2.5         | 24.56                 | 3.42    | 20.82 | 6.00       | 24.2        | 123  | 0.09              |
|   | 1235                         | 100        | 3.0         | 24.58                 | 3.42    | 20.80 | 6.00       | 24.0        | 123  | 0.09              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW09A

Project No: 501032

Sampler(s): Scott Beersinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW09A-1905 02-MSDDATE/TIME: 5/2/19 / 11:55Sample Interval 24.35 24.58

Sampling Method:

Sample Purpose: MSD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low Flow/BLADDER PUMPCasing ID (in.): 4Purge Start Date/Time: 5/2/19 1205Depth to Water - Initial (DTWi) (ft) 24.35Purge End Date/Time: 5/2/19 1235Depth to Well Bottom (ft) 38.77Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 22.80-37.50Discharge Tube Diameter: 1/4" Immersible Layer: Y / ☒ NApproximate depth of pump inlet\* (ft): 30.15Pump Start Time: 1205Ferrous Iron (Required Y or ☒ N) \_\_\_\_\_ mg/L



# Sample Collection Log

2 of 2

| Location ID: 67WW09A Sample No: 67WW09A-190502-MSD |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                    | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/2/19   | 1210                         | 100        | .5          | 24.42                 | 3.41    | 21.20 | 6.47       | 30.3        | 95   | 0.94              |
|  | 1215                         | 100        | 1.0         | 24.47                 | 3.37    | 20.77 | 6.03       | 24.1        | 120  | 0.31              |
|  | 1220                         | 100        | 1.5         | 24.51                 | 3.40    | 20.75 | 6.00       | 23.7        | 121  | 0.10              |
|  | 1225                         | 100        | 2.0         | 24.54                 | 3.41    | 20.78 | 6.00       | 23.9        | 122  | 0.09              |
|  | 1230                         | 100        | 2.5         | 24.56                 | 3.42    | 20.82 | 6.00       | 24.2        | 123  | 0.09              |
|  | 1235                         | 100        | 3.0         | 24.58                 | 3.42    | 20.80 | 6.00       | 24.0        | 123  | 0.09              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW10

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

cloudy

## SAMPLING INFORMATION

Sample No: 67WW10-190502

DATE/TIME: 5/2/19 / 1110

Sample Interval: 1231 - 22.53

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point: Top of Casing

Purging Method/Equipment: low flow/bladder pump

Casing ID (in.): 4

Purge Start Date/Time: 5/2/19 1115

Depth to Water - Initial (DTWi) (ft) 22.31

Purge End Date/Time: 5/2/19 1145

Depth to Well Bottom (ft) ~~50~~ 50.80

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 18.70 - 50.20

Discharge Tube Diameter: 1/4" Immersible Layer: Y/N

Approximate depth of pump inlet\* (ft): ~~34.75~~ 34.45

Pump Start Time: 1115

Ferrous Iron (Required Y or N) mg/L

2ND DTW pre-purge - 22.31



# Sample Collection Log

2 of 2

| Location ID: 67WW10 Sample No: 67WW10-1905 <u>02</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                      | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/2/19   | 1120                         | 100        | 1.5         | 22.39                 | 5.81    | 20.65 | 5.76       | 10.3        | 140  | 0.77              |
|  | 1125                         | 100        | 1.0         | 22.45                 | 5.83    | 20.54 | 5.52       | 15.9        | 153  | 0.19              |
|  | 1130                         | 100        | 1.5         | 22.48                 | 5.81    | 20.51 | 5.40       | 24.1        | 156  | 0.06              |
|  | 1135                         | 100        | 2.0         | 22.50                 | 5.80    | 20.49 | 5.39       | 24.7        | 157  | 0.06              |
|  | 1140                         | 100        | 2.5         | 22.52                 | 5.80    | 20.47 | 5.38       | 25.0        | 157  | 0.07              |
|  | 1145                         | 100        | 3.0         | 22.53                 | 5.80    | 20.46 | 5.37       | 25.4        | 157  | 0.06              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW11

Project No: 501032

Sampler(s): Scott Beggsinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW11-1905 01DATE/TIME: 5/1/19 / 0915Sample Interval: 21.21 - 21.44

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: low flow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 0925Depth to Water - Initial (DTWi) (ft) 21.21Purge End Date/Time: 5/1/19 0955Depth to Well Bottom (ft) ~~45.6~~ 46.64Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 21.75 - 46.25Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\*(ft): ~~32.75~~ 34.00Pump Start Time: 0925Ferrous Iron (Required Y or (N)) \_\_\_\_\_ mg/L2ND DTW pre-purge - 21.21





# Sample Collection Log

2 of 2

| Location ID: 67WW11      Sample No: 67WW11-1905 <u>0</u> |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading  | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19   | 0930                         | 100        | 1.5         | 21.28                 | 4.82    | 20.96 | 6.15       | 8.0         | 159  | 0.91              |
|  | 0935                         | 100        | 1.0         | 21.34                 | 4.61    | 20.68 | 5.40       | 6.2         | 190  | 0.64              |
|  | 0940                         | 100        | 1.5         | 21.39                 | 4.63    | 20.66 | 5.30       | 6.7         | 193  | 0.53              |
|  | 0945                         | 100        | 2.0         | 21.41                 | 4.64    | 20.64 | 5.30       | 6.9         | 194  | 0.52              |
|  | 0950                         | 100        | 2.5         | 21.43                 | 4.65    | 20.62 | 5.30       | 7.4         | 195  | 0.51              |
| ✓  | 0955                         | 100        | 3.0         | 21.44                 | 4.65    | 20.60 | 5.29       | 7.8         | 195  | 0.50              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW12

Project No: 501032

Sampler(s): Scott Beersinger

## FIELD CONDITIONS

Cloudy / Drizzle

## SAMPLING INFORMATION

Sample No: 67WW12-190502DATE/TIME: 5/2/19 / 1022Sample Interval 23.85-24.05

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow/Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 5/2/19 1030Depth to Water - Initial (DTWi) (ft) 23.85Purge End Date/Time: 5/2/19 1100Depth to Well Bottom (ft) 36.94Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 26.96-36.46Discharge Tube Diameter: 1/4" Immersible Layer: Y ☒ NApproximate depth of pump inlet\* (ft): 31.71Pump Start Time: 1030Ferrous Iron (Required Y or ☒ N) \_\_\_\_\_ mg/L

2ND DTW PR4-PURGE - 23.85



# Sample Collection Log

2 of 2

| Location ID: 67WW12      Sample No: 67WW12-190502 |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/2/19  | 1035                         | 100        | .5          | 23.92                 | 3.64    | 20.36 | 5.75       | 17.9        | 142  | 1.29              |
|   | 1040                         | 100        | 1.0         | 23.96                 | 3.59    | 20.09 | 5.48       | 9.3         | 177  | 0.83              |
|   | 1045                         | 100        | 1.5         | 24.00                 | 3.58    | 20.07 | 5.38       | 8.5         | 185  | 0.64              |
|   | 1050                         | 100        | 2.0         | 24.02                 | 3.57    | 20.10 | 5.37       | 7.9         | 186  | 0.63              |
|   | 1055                         | 100        | 2.5         | 24.04                 | 3.56    | 20.15 | 5.36       | 7.0         | 186  | 0.62              |
| ✓   | 1100                         | 100        | 3.0         | 24.05                 | 3.56    | 20.12 | 5.35       | 6.3         | 187  | 0.61              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW13

Project No: 501032

Sampler(s): SLO # BERSINGER

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW13-190501DATE/TIME: 5/1/19 / 0724Sample Interval: 20.18 - 20.40

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses                           | Container       | Preserv |
|------------------|-----------|-------|------------------------------------|-----------------|---------|
|                  |           | ALSHT | Anions in Water by 9056            | 1 x 250 mL HDPE | Cool 4C |
|                  |           | ALSHT | Carbon Dioxide in Water by RSK175  | 3 x 40 mL Glass | Cool 4C |
|                  |           | ALSHT | Dissolved Gases in Water by RSK175 | 3 x 40 mL Glass | HCL<pH2 |
|                  |           | ALSHT | TOC in Water by SM5310C            | 2 x 40 mL Amber | H2SO4   |
|                  |           | ALSHT | VOCs in Water by 8260B             | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Lowflow/BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 0730Depth to Water - Initial (DTWi) (ft) 20.18Purge End Date/Time: 5/1/19 0800Depth to Well Bottom (ft) 28.60Discharge Tube Length: NAPID Reading: NAScreen Interval (ft): 13.60 - 28.10Discharge Tube Diameter: 1/4"Immersible Layer: Y (N)Approximate depth of pump inlet\* (ft): 13.35 20.85Pump Start Time: 0730Ferrous Iron (Required (Y) or N) 0.00 mg/L2ND DTW PRE-PURGE - 20.18



# Sample Collection Log

2 of 2

| Location ID: 67WW13 |                              |            |             |                       | Sample No: 67WW13-1905 <u>01</u> |       |            |             |                |                   |
|---------------------|------------------------------|------------|-------------|-----------------------|----------------------------------|-------|------------|-------------|----------------|-------------------|
| Date of Reading     | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.                            | Temp. | pH         | Turbidity   | ORP            | DO                |
|                     |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm)                          | (°C)  |            | (NTU)       | (mV)           | (mg/L)            |
|                     | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%                             |       | ±0.1 units | No criteria |                | ± 10% or 0.2 mg/L |
| 5/1/19              | 0735                         | 100        | .5          | 20.25                 | 4.77                             | 22.36 | 6.93       | 0.0         | <del>180</del> | 3.39              |
|                     | 0740                         | 100        | 1.0         | 20.30                 | 4.82                             | 21.63 | 5.81       | 0.0         | 199            | 2.97              |
|                     | 0745                         | 100        | 1.5         | 20.34                 | 4.82                             | 21.55 | 5.50       | 0.0         | 206            | 2.85              |
|                     | 0750                         | 100        | 2.0         | 20.37                 | 4.83                             | 21.49 | 5.49       | 0.0         | 207            | 2.82              |
|                     | 0755                         | 100        | 2.5         | 20.39                 | 4.83                             | 21.41 | 5.49       | 0.0         | 208            | 2.79              |
|                     | 0800                         | 100        | 3.0         | 20.40                 | 4.83                             | 21.37 | 5.48       | 0.0         | 209            | 2.77              |
|                     |                              |            |             |                       |                                  |       |            |             |                |                   |
|                     |                              |            |             |                       |                                  |       |            |             |                |                   |
|                     |                              |            |             |                       |                                  |       |            |             |                |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW13

Project No: 501032

Sampler(s): Scott Bresinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW13-1905 01-FDDATE/TIME: 5/1/19 / 0721Sample Interval: 20.18 - 20.40

Sampling Method:

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses                           | Container       | Preserv |
|------------------|-----------|-------|------------------------------------|-----------------|---------|
|                  |           | ALSHT | Anions in Water by 9056            | 1 x 250 mL HDPE | Cool 4C |
|                  |           | ALSHT | Carbon Dioxide in Water by RSK175  | 3 x 40 mL Glass | Cool 4C |
|                  |           | ALSHT | Dissolved Gases in Water by RSK175 | 3 x 40 mL Glass | HCL<pH2 |
|                  |           | ALSHT | TOC in Water by SM5310C            | 2 x 40 mL Amber | H2SO4   |
|                  |           | ALSHT | VOCs in Water by 8260B             | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow/Bladder PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 0730Depth to Water - Initial (DTWi) (ft) 20.18Purge End Date/Time: 5/1/19 0800Depth to Well Bottom (ft) ~~28.60~~ 28.60Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 13.60 - 28.10Discharge Tube Diameter: 1/4" Immersible Layer: Y ☒ NApproximate depth of pump inlet\*(ft): ~~13.75~~ 20.85Pump Start Time: 0730Ferrous Iron (Required ☒ or N) 0.00 mg/L





# Sample Collection Log

2 of 2

| Location ID: 67WW13 Sample No: 67WW13-1905 <u>01</u> -FD |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading  | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19   | 0735                         | 100        | .5          | 20.25                 | 4.77    | 22.36 | 6.43       | 0.0         | 180  | 3.39              |
|  | 0740                         | 100        | 1.0         | 20.30                 | 4.82    | 21.63 | 5.81       | 0.0         | 199  | 2.97              |
|  | 0745                         | 100        | 1.5         | 20.34                 | 4.82    | 21.55 | 5.50       | 0.0         | 206  | 2.85              |
|  | 0750                         | 100        | 2.0         | 20.37                 | 4.83    | 21.49 | 5.49       | 0.0         | 207  | 2.82              |
|  | 0755                         | 100        | 2.5         | 20.39                 | 4.83    | 21.41 | 5.49       | 0.0         | 208  | 2.79              |
|  | 0800                         | 100        | 3.0         | 20.40                 | 4.83    | 21.37 | 5.48       | 0.0         | 209  | 2.77              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW14

Project No: 501032

Sampler(s): SCOTT BEESINGER

## FIELD CONDITIONS

cloudy / LIGHT RAIN

## SAMPLING INFORMATION

Sample No: 67WW14-190502DATE/TIME: 5/2/19 / 0833Sample Interval: 18.78-1902

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 2

Purge Start Date/Time: 5/2/19 0845Depth to Water - Initial (DTWi) (ft) 18.78Purge End Date/Time: 5/2/19 0915Depth to Well Bottom (ft) 30.62Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 20.40-30.40Discharge Tube Diameter: 1/4" Immersible Layer: Y/NApproximate depth of pump inlet\*(ft): 25.40Pump Start Time: 0845Ferrous Iron (Required Y or N) \_\_\_\_\_ mg/L2ND DTW pre-purge - 18.78



# Sample Collection Log

2 of 2

| Location ID: 67WW14      Sample No: 67WW14-1905 <u>02</u> |                              |            |             |                       |         |       |            |             |      |                   |
|---|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading   | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|   |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|   | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/21/9  | 0850                         | 100        | .5          | 18.85                 | 2.16    | 21.37 | 6.32       | 17.4        | 215  | 1.11              |
|   | 0855                         | 100        | 1.0         | 18.91                 | 2.15    | 20.96 | 5.98       | 30.3        | 226  | 0.49              |
|   | 0900                         | 100        | 1.5         | 18.95                 | 2.16    | 20.92 | 5.90       | 30.1        | 227  | 0.30              |
|   | 0905                         | 100        | 2.0         | 18.97                 | 2.17    | 20.89 | 5.89       | 30.4        | 227  | 0.29              |
|   | 0910                         | 100        | 2.5         | 19.00                 | 2.17    | 20.86 | 5.89       | 30.5        | 228  | 0.28              |
|   | 0915                         | 100        | 3.0         | 19.02                 | 2.17    | 20.83 | 5.89       | 30.6        | 228  | 0.27              |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |
|   |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_





# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW15

Project No: 501032

Sampler(s): Scott Bessinger

## FIELD CONDITIONS

CLEAR / SUNNY

## SAMPLING INFORMATION

Sample No: 67WW15-190503DATE/TIME: 5/3/19 / 0823Sample Interval: 22.04 22.23

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv   |
|------------------|-----------|-------|------------------------|-----------------|-----------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL < pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/3/19 0835Depth to Water - Initial (DTWi) (ft) 22.04Purge End Date/Time: 5/3/19 0905Depth to Well Bottom (ft) 47.43Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 37.53 - 47.23Discharge Tube Diameter: 1/4" Immersible Layer: Y / (N)Approximate depth of pump inlet\*(ft): ~~39.05~~ 42.38Pump Start Time: 0835Ferrous Iron (Required Y or (N)) \_\_\_\_\_ mg/L

2ND DTW PRE-PURGE - 22.04



# Sample Collection Log

2 of 2

| Location ID: 67WW15 Sample No: 67WW15-1905 <sup>03</sup> |                              |            |                |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|----------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading  | Time of Reading              | Purge Rate | Total Purge    | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)            | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -              | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/3/19   | 0840                         | 100        | <del>1.5</del> | 22.10                 | 1.94    | 20.30 | 6.31       | 0.0         | 184  | 3.67              |
|  | 0845                         | 100        | 1.0            | 22.15                 | 1.92    | 20.26 | 5.80       | 0.0         | 208  | 3.38              |
|  | 0850                         | 100        | 1.5            | 22.19                 | 1.92    | 20.28 | 5.45       | 0.0         | 229  | 2.91              |
|  | 0855                         | 100        | 2.0            | 22.21                 | 1.93    | 20.30 | 5.44       | 0.0         | 230  | 2.88              |
|  | 0900                         | 100        | 2.5            | 22.22                 | 1.93    | 20.32 | 5.44       | 0.0         | 231  | 2.86              |
| ✓  | 0905                         | 100        | 3.0            | 22.23                 | 1.93    | 20.33 | 5.43       | 0.0         | 231  | 2.85              |
|  |                              |            |                |                       |         |       |            |             |      |                   |
|  |                              |            |                |                       |         |       |            |             |      |                   |
|  |                              |            |                |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



# Sample Collection Log

1 of 2

Project Name: Longhorn AAP

Location ID: 67WW161

Project No: 501032

Sampler(s): Scott Beesinger

## FIELD CONDITIONS

Cloudy

## SAMPLING INFORMATION

Sample No: 67WW161-190501DATE/TIME: 5/1/19 / 1005Sample Interval: 21.8 21.98

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples

Decontamination Procedures

|  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |

| Chain of Custody | COC Notes | Lab   | Analyses               | Container       | Preserv |
|------------------|-----------|-------|------------------------|-----------------|---------|
|                  |           | ALSHT | VOCs in Water by 8260B | 3 x 40 mL Glass | HCL<pH2 |

## WELL AND PURGING INFORMATION

Measuring Point : Top of CasingPurging Method/Equipment: Low flow / BLADDER PumpCasing ID (in.): 4Purge Start Date/Time: 5/1/19 1015Depth to Water - Initial (DTWi) (ft) 21.80Purge End Date/Time: 5/1/19 1045Depth to Well Bottom (ft) 80.38Discharge Tube Length: NA PID Reading: NAScreen Interval (ft): 70.43-80.13Discharge Tube Diameter: 1/4" Immersible Layer: Y / NApproximate depth of pump inlet\*(ft): 72.36 75.28Pump Start Time: 1015Ferrous Iron (Required Y or N) N mg/L

2ND DTW pre-purge - 21.80





# Sample Collection Log

2 of 2

| Location ID: 67WW16I Sample No: 67WW16I-190501 |                              |            |             |                       |         |       |            |             |      |                   |
|--|------------------------------|------------|-------------|-----------------------|---------|-------|------------|-------------|------|-------------------|
| Date of Reading                                | Time of Reading              | Purge Rate | Total Purge | DTW                   | Cond.   | Temp. | pH         | Turbidity   | ORP  | DO                |
|  |                              | (ml/min)   | (L)         | (ft)                  | (mS/cm) | (°C)  |            | (NTU)       | (mV) | (mg/L)            |
|  | Purge Stabilization Criteria | -          | -           | Drawdown limit 0.3 ft | ±10%    |       | ±0.1 units | No criteria |      | ± 10% or 0.2 mg/L |
| 5/1/19   | 1020                         | 100        | 1.5         | 21.85                 | 1.49    | 22.61 | 6.01       | 4.5         | 12   | 3.95              |
|  | 1025                         | 100        | 1.0         | 21.90                 | 1.50    | 22.55 | 5.57       | 3.4         | 20   | 2.41              |
|  | 1030                         | 100        | 1.5         | 21.93                 | 1.50    | 22.53 | 5.36       | 2.9         | 19   | 1.70              |
|  | 1035                         | 100        | 2.0         | 21.95                 | 1.50    | 22.51 | 5.35       | 2.5         | 18   | 1.67              |
|  | 1040                         | 100        | 2.5         | 21.97                 | 1.50    | 22.49 | 5.35       | 2.1         | 18   | 1.65              |
|  | 1045                         | 100        | 3.0         | 21.98                 | 1.50    | 22.48 | 5.35       | 1.9         | 18   | 1.63              |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |
|  |                              |            |             |                       |         |       |            |             |      |                   |

Logged by: \_\_\_\_\_

Date: \_\_\_\_\_

QC'd by: \_\_\_\_\_

Date: \_\_\_\_\_



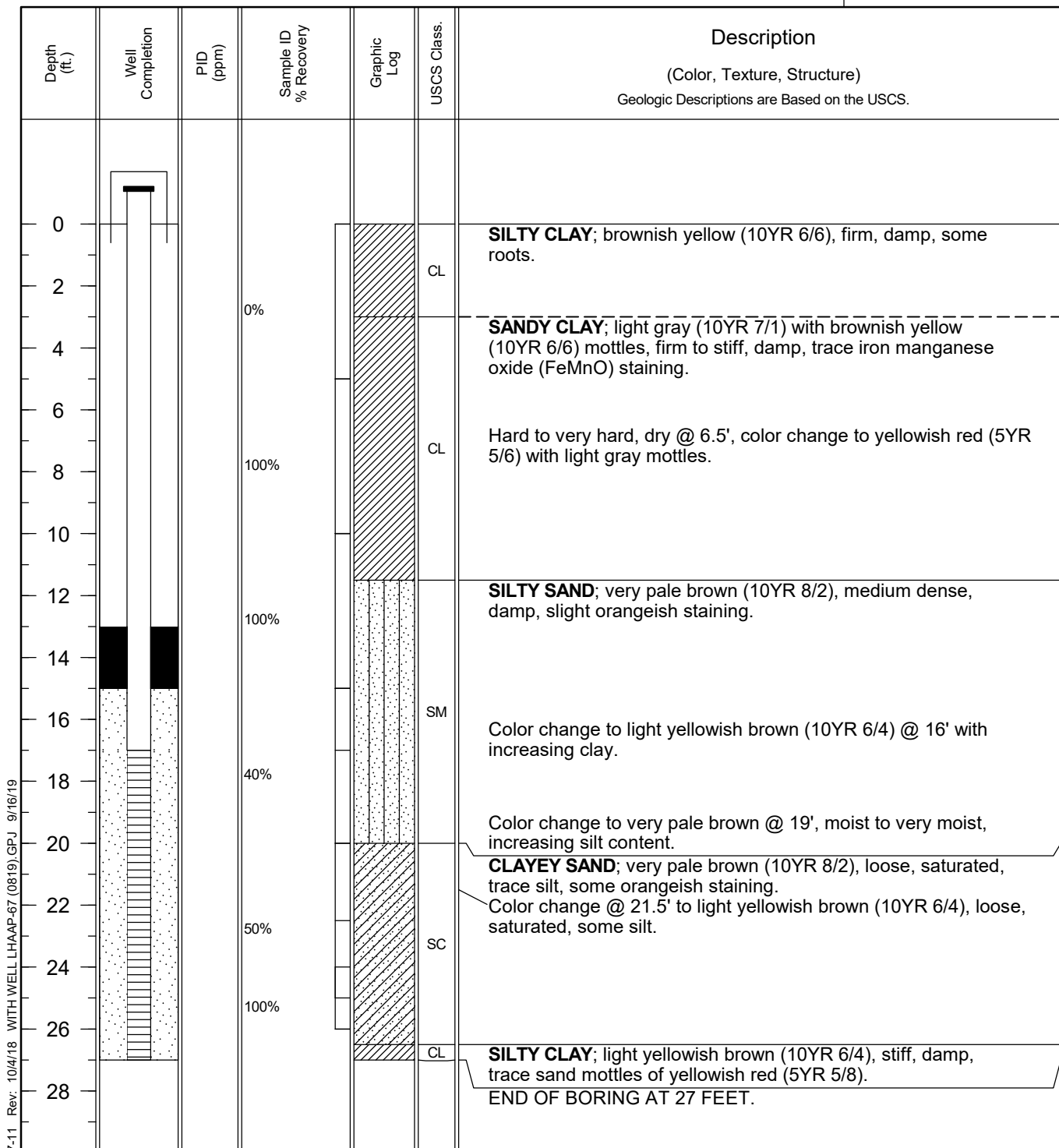
# Drilling Log

## Monitoring Well 67WW17

Page: 1 of 1

Project Longhorn Army Ammunition Plant Owner U.S. Army  
 Location LHAAP-67 Proj. No. 501032  
 Surface Elev. NA Total Hole Depth 27.0 ft. North \_\_\_\_\_ East \_\_\_\_\_  
 Top of Casing NA Water Level Initial ~20' bgs Static NA Diameter 10 in.  
 Screen: Dia 4 in. Length 10 ft. Type/Size SCH. 40 PVC/0.010 in.  
 Casing: Dia 4 in. Length 17 ft. Type SCH. 40 PVC  
 Fill Material 20/40 Sand, Bent. Chips, Portland Cement Grout Rig/Core Dietrich B-50 Tracked Rig  
 Drill Co. ETTL Driller Name Pedro Gonzales Driller # 59385  
 Log By W. Foss Date 8/8/19

COMMENTS:  
 4" Dia. well set at 27' bgs with  
 10' Sch. 40 PVC 0.010" slot  
 screen





# Drilling Log

## Monitoring Well 67WW18

Page: 1 of 2

Project Longhorn Army Ammunition Plant Owner U.S. Army  
 Location LHAAP-67 Proj. No. 501032  
 Surface Elev. NA Total Hole Depth 42.0 ft. North \_\_\_\_\_ East \_\_\_\_\_  
 Top of Casing NA Water Level Initial ~15.5' bgs Static NA Diameter 10 in.  
 Screen: Dia 4 in. Length 10 ft. Type/Size SCH. 40 PVC/0.010 in.  
 Casing: Dia 4 in. Length 29 ft. Type SCH. 40 PVC  
 Fill Material Filter Sand, Bentonite Chips Rig/Core Dietrich B-50 Tracked Rig  
 Drill Co. ETTL Driller Name Rich Hermann Driller # 59385  
 Log By W. Foss Date 7/30/19

**COMMENTS:**  
 4" Dia. Well set at 39' bgs with  
 10' Sch. 40 PVC 0.010" slot  
 screen

| Depth<br>(ft.) | Well<br>Completion | PID<br>(ppm) | Sample ID<br>% Recovery | Graphic<br>Log | USCS Class. | Description<br><br>(Color, Texture, Structure)<br><br>Geologic Descriptions are Based on the USCS.                       |
|----------------|--------------------|--------------|-------------------------|----------------|-------------|--|
| 0              |                    |              |                         |                | CL          | <b>SILTY CLAY TOPSOIL</b> ; brown (7.5YR 4/4), soft, moist, some roots.  |
| 2              |                    |              |                         |                | CL          | <b>SILTY CLAY</b> ; light gray (10YR 7/2), firm to stiff, damp, trace sand, trace iron manganese oxide (FeMnO) staining. |
| 4              |                    |              |                         |                | CL          | <b>SAA</b> , with orange F3 oxidation mottling @ 5-7.5'.   |
| 6              |                    |              |                         |                | CL          |  |
| 8              |                    |              |                         |                | CL          | <b>SANDY CLAY</b> ; yellowish brown (10YR 5/6), firm, moist, light gray mottling (10YR 7/2), trace silt.                 |
| 10             |                    |              |                         |                | CL          |  |
| 12             |                    |              |                         |                | SC          | <b>CLAYEY SAND</b> ; pale brown (10YR 6/3), loose, moist, trace silt.  |
| 14             |                    |              |                         |                | SC          |  |
| 16             |                    |              |                         |                | SM          | <b>SILTY SAND</b> ; light gray (10YR 7/1), loose to medium dense, saturated.   |
| 18             |                    |              |                         |                | SM          |  |
| 20             |                    |              |                         |                | SM          |  |
| 22             |                    |              | 100%                    |                | SM          |  |
| 24             |                    |              | 100%                    |                | SM          | <b>SILTY SAND</b> ; light brownish gray (10YR 6/2), loose to medium dense, saturated.                                    |
| 26             |                    |              | 100%                    |                | CL          | <b>SANDY CLAY</b> ; light yellowish brown (2.5YR 6/3), oft, wet, trace silt.   |

Continued Next Page




# Drilling Log

Monitoring Well **67WW18**

Page: 2 of 2

Project Longhorn Army Ammunition PlantOwner U.S. ArmyLocation LHAAP-67Proj. No. 501032

| Depth<br>(ft.) | Well<br>Completion | PID<br>(ppm) | Sample ID<br>% Recovery | Graphic<br>Log | USCS Class. | Description<br><br>(Color, Texture, Structure)<br><br>Geologic Descriptions are Based on the USCS.                         |
|----------------|--------------------|--------------|-------------------------|----------------|-------------|--|
| 26             |                    |              | 100%                    |                | SC          | <i>Continued</i><br><b>CLAYEY SAND</b> ; light brownish gray (10YR 6/2) with orange mottles, medium dense, saturated.      |
| 28             |                    |              | 100%                    |                |             | <b>SILTY CLAY</b> ; brown (10YR 2/3) with orange mottles, stiff, moist, trace sand.  |
| 30             |                    |              | 100%                    |                | CL          | <b>SANDY CLAY</b> ; light brownish gray (10YR 6/2), stiff, 2-3" light gray sand lenses interbedded, moist, trace silt.     |
| 32             |                    |              | 100%                    |                |             |  |
| 34             |                    |              | 100%                    |                | SM          | <b>SILTY SAND</b> ; pale brown (10YR 6/3), loose, wet, trace clay.   |
| 36             |                    |              | 100%                    |                | CL          | <b>SANDY CLAY</b> ; gray (10YR 6/1), stiff, moist, trace orange mottling.  |
| 38             |                    |              | 100%                    |                | SC          | <b>CLAYEY SAND</b> ; light gray (10YR 7/1), medium dense, saturated, some silt.  |
| 40             |                    |              | 100%                    |                | CL          | <b>SANDY CLAY</b> ; gray (5Y 6/1) with very pale brown (10YR 7/3) mottles, stiff, damp, trace silt, trace FeMnO oxidation. |
| 42             |                    |              | 100%                    |                |             | <b>END OF BORING AT 42 FEET.</b>   |
| 44             |                    |              |                         |                |             |  |
| 46             |                    |              |                         |                |             |  |
| 48             |                    |              |                         |                |             |  |
| 50             |                    |              |                         |                |             |  |
| 52             |                    |              |                         |                |             |  |
| 54             |                    |              |                         |                |             |  |
| 56             |                    |              |                         |                |             |  |
| 58             |                    |              |                         |                |             |  |
| 60             |                    |              |                         |                |             |  |

| LONGHORN ARMY AMMUNITION PLANT (LHAAP) - KARNACK, TEXAS  |  |               |                   |                 |
|--|--|---------------|-------------------|-----------------|
| PREPARED FOR APTIM Federal Services, LLC.  |  |               |                   |                 |
| 2500 CityWest Blvd, Suite 1700   |  |               |                   |                 |
| Houston, Texas 77042   |  |               |                   |                 |
|  | TEXAS STATE PLANE COORDINATE SYSTEM                  |               |                   |                 |
|  | NORTH CENTRAL ZONE (4202), 1983 NORTH AMERICAN DATUM |               |                   |                 |
| MONITORING WELL  | NORTHING   | EASTING       | NAVD 88 ELEVATION |                 |
|  | TOP OF CASING  | TOP OF CASING | TOP OF CASING     | GROUND          |
| 04WW06   | 6959225.38   | 3305871.99    | 215.63            | 212.52          |
| 04WW07   | 6959038.63   | 3306006.11    | 214.64            | 211.66          |
| 04WW08   | 6959148.15   | 3305963.41    | 214.82            | 212.07          |
| 04WW09   | 6959090.67   | 3305897.71    | 214.61            | 211.47          |
| 04WW10   | 6959041.73   | 3305928.94    | 213.67            | 210.40          |
| 04WW11   | 6959032.36   | 3305839.02    | 212.01            | 209.31          |
| 17WW19   | 6952718.36   | 3315313.67    | 180.08            | 176.63          |
| 17PZ01   | 6952783.40   | 3315662.50    | 177.22            | 174.14          |
| 17PZ02   | 6952764.55   | 3315647.64    | 177.75            | 174.57          |
| 17PZ03   | 6952773.35   | 3115739.59    | 177.76            | 174.69          |
| 17WW20   | 6952980.24   | 3315580.24    | 180.02            | 177.13          |
| FLOWLINE CREEK 1   | 6958236.20   | 3307772.02    | 198.47 TOP BANK   | 191.49 FLOWLINE |
| FLOWLINE CREEK 2   | 6958026.38   | 3308220.92    | 196.62 TOP BANK   | 189.16 FLOWLINE |
| 12 WW 10R  | 6954500.48   | 3311807.57    | 203.65            | 200.16          |
| 16 IW 09   | 6953396.09   | 3314160.35    | 181.41            | 178.08          |
| 16 IW 20   | 6953823.60   | 3314557.01    | 188.94            | 186.03          |
| 16 RW 01   | 6953551.08   | 3314168.77    | 189.77            | 186.56          |
| 16 RW 03   | 6953407.93   | 3314167.37    | 181.66            | 178.32          |
| 16 RW 04   | 6953535.89   | 3314226.20    | 190.94            | 188.04          |
| 16 RW 05   | 6953395.99   | 3314192.31    | 180.70            | 177.61          |
| 16 RW 11   | 6953828.09   | 3314545.02    | 189.95            | 187.46          |
| 16 RW 12   | 6953887.58   | 3314501.01    | 196.22            | 193.23          |
| 16 WW 48   | 6953695.43   | 3314485.33    | 184.41            | 181.46          |
| 16 WW 56   | 6953958.38   | 3314545.68    | 198.61            | 195.35          |
| 16 WW 57   | 6953896.70   | 3314654.99    | 177.06            | 173.12          |
| 16 WW 58   | 6953665.15   | 3314691.22    | 177.24            | 173.32          |
| 16IW10   | 6953780.74   | 3314013.26    | 195.90            | 192.69          |
| 16IW27   | 6953691.80   | 3314332.92    | 196.05            | 193.04          |
| 16IW28   | 6953655.99   | 3314347.06    | 189.50            | 186.62          |
| 16IW29   | 6953590.95   | 3314379.27    | 185.89            | 182.76          |
| 16IW30   | 6953570.27   | 3314398.21    | 184.74            | 181.72          |
| 16RW06   | 6953828.03   | 3313990.94    | 197.37            | 194.35          |
| 16RW07   | 6953785.38   | 3313988.18    | 195.48            | 192.20          |
| 16RW08   | 6953788.82   | 3314017.82    | 196.37            | 193.62          |
| 16RW09   | 6953821.11   | 3314045.50    | 197.81            | 195.14          |
| 16RW10   | 6953763.40   | 3314053.06    | 195.25            | 192.27          |
| 16RW25   | 6953777.99   | 3314293.02    | 199.24            | 196.29          |
| 16RW26   | 6953754.86   | 3314304.29    | 198.97            | 195.66          |
| 16WW49   | 6953750.74   | 3314402.85    | 190.69            | 187.66          |
| 16WW51   | 6953616.52   | 3314455.29    | 183.26            | 180.13          |
| 16WW55   | 6953802.81   | 3314115.62    | 194.03            | 191.11          |
| 67WW17   | 6957124.71   | 3311329.95    | 199.73            | 196.33          |
| 67WW18   | 6957000.55   | 3311152.49    | 198.90            | 195.29          |
| 50WW29   | 6957690.02   | 3309981.51    | 195.63            | 192.18          |
| <div><div>DAVID R. COLLINS, JR.</div><div>R.P.L.S.#6488</div><div>SURVEY DATE: OCTOBER 24, 2019</div></div> <div></div> |  |               |                   |                 |

# **Appendix D**

## **Laboratory Analytical Data Package**

**(Provided on CD)**





10515 Research Drive  
Knoxville, TN 37932  
Phone: (865) 573-8188  
Fax: (865) 573-8133

---

**Client:** Sharon Pennington  
APTIM  
2410 Cherahala Blvd  
Knoxville, TN 37932  
United States

**Phone:** 865-690-3211

**Fax:**

**Identifier:** 008PE

**Date Rec:** 05/02/2018

**Report Date:** 05/08/2018

**Client Project #:** 501032

**Client Project Name:** Longhorn AAP - LHAAP-67

**Purchase Order #:** 204818

**Analysis Requested:** Cancelled, CENSUS, Miscellaneous

**Reviewed By:**

A handwritten signature in black ink, appearing to read 'Joan Spem'.

---

NOTICE: This report is intended only for the addressee shown above and may contain confidential or privileged information. If the recipient of this material is not the intended recipient or if you have received this in error, please notify Microbial Insights, Inc. immediately. The data and other information in this report represent only the sample(s) analyzed and are rendered upon condition that it is not to be reproduced without approval from Microbial Insights, Inc. Thank you for your cooperation.

**MICROBIAL INSIGHTS, INC.**

10515 Research Dr., Knoxville, TN 37932  
Tel. (865) 573-8188 Fax. (865) 573-8133

**CENSUS**

**Client:** APTIM  
**Project:** Longhorn AAP - LHAAP-67

**MI Project Number:** 008PE  
**Date Received:** 05/02/2018

**Sample Information**

|                          |                     |                     |
|--------------------------|---------------------|---------------------|
| <b>Client Sample ID:</b> | <b>67WW13-18050</b> | <b>67WW08-18050</b> |
|                          | <b>1</b>            | <b>1</b>            |
| <b>Sample Date:</b>      | 05/01/2018          | 05/01/2018          |
| <b>Units:</b>            | cells/mL            | cells/mL            |
| <b>Analyst/Reviewer:</b> | JS                  | JS                  |

**Dechlorinating Bacteria**

|                        |            |                     |                     |
|------------------------|------------|---------------------|---------------------|
| <i>Dehalococcoides</i> | <i>DHC</i> | <b>2.00E-01 (J)</b> | <b>2.00E-01 (J)</b> |
|------------------------|------------|---------------------|---------------------|

**Legend:**

NA = Not Analyzed    NS = Not Sampled    J = Estimated gene copies below PQL but above LQL    I = Inhibited  
< = Result not detected

## Quality Assurance/Quality Control Data

Samples Received 5/2/2018

| Component | Date Prepared | Date Analyzed | Arrival<br>Temperature | Positive<br>Control | Extraction<br>Blank | Negative<br>Control |
|-----------|---------------|---------------|------------------------|---------------------|---------------------|---------------------|
| DHC       | 05/02/2018    | 05/07/2018    | 0 °C                   | 102%                | non-detect          | non-detect          |



---

10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887

December 03, 2018

Kim Napier  
Aptim Environmental & Infrastructure, Inc.  
2500 City West Blvd., Suite 1700  
Houston, TX 77042

Work Order: **HS18101278**

Laboratory Results for: **LHAAP-67**

Dear Kim,

ALS Environmental received 10 sample(s) on Oct 24, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL  
RJ Modashia  
Project Manager

## ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**Work Order:** HS18101278

## SAMPLE SUMMARY

| Lab Samp ID   | Client Sample ID | Matrix      | TagNo            | Collection Date   | Date Received     | Hold                                |
|---------------|------------------|-------------|------------------|-------------------|-------------------|-------------------------------------|
| HS18101278-01 | 67WW14-181022    | Groundwater |                  | 22-Oct-2018 12:55 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-02 | 67WW12-181022    | Groundwater |                  | 22-Oct-2018 13:45 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-03 | 67WW10-181022    | Groundwater |                  | 22-Oct-2018 14:35 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-04 | 67WW13-181023    | Groundwater |                  | 23-Oct-2018 09:35 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-05 | 67WW08-181023    | Groundwater |                  | 23-Oct-2018 10:45 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-06 | 67WW08-181023-FD | Groundwater |                  | 23-Oct-2018 10:45 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-07 | 67WW11-181023    | Groundwater |                  | 23-Oct-2018 11:55 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-08 | 67WW09-181023    | Groundwater |                  | 23-Oct-2018 12:45 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-09 | 67WW15-181023    | Groundwater |                  | 23-Oct-2018 13:35 | 24-Oct-2018 08:55 | <input type="checkbox"/>            |
| HS18101278-10 | Trip Blank       | Water       | ALS<br>071918-84 | 23-Oct-2018 00:00 | 24-Oct-2018 08:55 | <input checked="" type="checkbox"/> |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

**CASE NARRATIVE**

Project: LHAAP-67

Work Order:

**Work Order Comments**

- The analysis for Methane, Methene, Ethane and CO2 by RSK175 was subcontracted to ALS Simi Valley, CA. Final report attached.
- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

**GCMS Volatiles by Method SW8260**

Batch ID: R326371

Sample ID: 67WW14-181022 (HS18101278-01MS)

- The recovery of the Matrix Spike (MS) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The recovery of the MS may be due to sample matrix interference.

Sample ID: 67WW14-181022 (HS18101278-01MSD)

- The recovery of the Matrix Spike Duplicate (MSD) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The failed recovery of the MSD may be due to sample matrix interference.

**Wet Chemistry by Method SW9056**

Batch ID: R326431

Sample ID: HS18101236-18MSD

- MSD is for an unrelated sample.

**Wet Chemistry by Method E376.1**

Batch ID: R326270

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method SM2320B**

Batch ID: R326282

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**WetChemistry by Method SM3500FED**

Batch ID: R326268

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW14-181022  
 Collection Date: 22-Oct-2018 12:55

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-01  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,1,2-Trichloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| <b>1,1-Dichloroethane</b>             | <b>1.3</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 13:33 |
| <b>1,1-Dichloroethene</b>             | <b>6.6</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 13:33 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| <b>1,2-Dichloroethane</b>             | <b>2.5</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 13:33 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 13:33 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW14-181022  
 Collection Date: 22-Oct-2018 12:55

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-01  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 13:33 |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | 93.8   |                      |      | 0    | 70-126 | %REC  | 1                  | 28-Oct-2018 13:33 |
| <i>Surr: 4-Bromofluorobenzene</i>     | 100    |                      |      | 0    | 81-113 | %REC  | 1                  | 28-Oct-2018 13:33 |
| <i>Surr: Dibromofluoromethane</i>     | 96.9   |                      |      | 0    | 77-123 | %REC  | 1                  | 28-Oct-2018 13:33 |
| <i>Surr: Toluene-d8</i>               | 94.2   |                      |      | 0    | 82-127 | %REC  | 1                  | 28-Oct-2018 13:33 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW12-181022  
 Collection Date: 22-Oct-2018 13:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-02  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,1,2-Trichloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,1-Dichloroethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| <b>1,1-Dichloroethene</b>             | <b>4.8</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 15:11 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2-Dichloroethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 15:11 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW12-181022  
 Collection Date: 22-Oct-2018 13:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-02  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Chloromethane                         | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| cis-1,2-Dichloroethene                | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Dibromomethane                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Ethylbenzene                          | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0  | 1.0      | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| m,p-Xylene                            | 1.0         | U                    | 0.50 | 1.0      | 2.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Methylene chloride                    | 1.0         | U                    | 1.0  | 1.0      | 2.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Naphthalene                           | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| o-Xylene                              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Styrene                               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Toluene                               | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Trichloroethene                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| Vinyl chloride                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 28-Oct-2018 15:11        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>97.0</i> |                      |      | <b>0</b> | <i>70-126</i> | <i>%REC</i> | <i>1</i>           | <i>28-Oct-2018 15:11</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.6</i> |                      |      | <b>0</b> | <i>81-113</i> | <i>%REC</i> | <i>1</i>           | <i>28-Oct-2018 15:11</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>97.1</i> |                      |      | <b>0</b> | <i>77-123</i> | <i>%REC</i> | <i>1</i>           | <i>28-Oct-2018 15:11</i> |
| <i>Surr: Toluene-d8</i>               | <i>93.1</i> |                      |      | <b>0</b> | <i>82-127</i> | <i>%REC</i> | <i>1</i>           | <i>28-Oct-2018 15:11</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW10-181022  
 Collection Date: 22-Oct-2018 14:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-03  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL | DL                   | LOD  | LOQ | UNITS | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|--------|------|----------------------|------|-----|-------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        |      | <b>Method:SW8260</b> |      |     |       | Analyst: AKP    |                   |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1,1-Trichloroethane                 | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1,2-Trichloroethane                 | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1-Dichloroethane                    | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1-Dichloroethene                    | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,1-Dichloropropene                   | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2,3-Trichlorobenzene                | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2,3-Trichloropropane                | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2,4-Trichlorobenzene                | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2,4-Trimethylbenzene                | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U    | 1.0                  | 1.0  | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2-Dibromoethane                     | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2-Dichlorobenzene                   | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2-Dichloroethane                    | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,2-Dichloropropane                   | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,3,5-Trimethylbenzene                | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,3-Dichlorobenzene                   | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,3-Dichloropropane                   | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 1,4-Dichlorobenzene                   | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 2,2-Dichloropropane                   | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 2-Butanone                            | 1.0    | U    | 0.50                 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 2-Chlorotoluene                       | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 2-Hexanone                            | 1.0    | U    | 1.0                  | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 4-Chlorotoluene                       | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 4-Isopropyltoluene                    | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| 4-Methyl-2-pentanone                  | 1.0    | U    | 0.70                 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Acetone                               | 2.0    | U    | 2.0                  | 2.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Benzene                               | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Bromobenzene                          | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Bromochloromethane                    | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Bromodichloromethane                  | 0.50   | U    | 0.20                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Bromoform                             | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Bromomethane                          | 0.50   | U    | 0.40                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Carbon disulfide                      | 1.0    | U    | 0.60                 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Carbon tetrachloride                  | 0.50   | U    | 0.50                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Chlorobenzene                         | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |
| Chloroethane                          | 0.50   | U    | 0.30                 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 15:35 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW10-181022  
 Collection Date: 22-Oct-2018 14:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-03  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 15:35 |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | 95.8   |                      |      | 0    | 70-126 | %REC  | 1                  | 28-Oct-2018 15:35 |
| <i>Surr: 4-Bromofluorobenzene</i>     | 99.2   |                      |      | 0    | 81-113 | %REC  | 1                  | 28-Oct-2018 15:35 |
| <i>Surr: Dibromofluoromethane</i>     | 98.7   |                      |      | 0    | 77-123 | %REC  | 1                  | 28-Oct-2018 15:35 |
| <i>Surr: Toluene-d8</i>               | 93.1   |                      |      | 0    | 82-127 | %REC  | 1                  | 28-Oct-2018 15:35 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW13-181023  
 Collection Date: 23-Oct-2018 09:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-04  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| <b>1,1,2-Trichloroethane</b>          | <b>6.1</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:04 |
| <b>1,1-Dichloroethane</b>             | <b>32</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:04 |
| <b>1,1-Dichloroethene</b>             | <b>570</b> |                      | <b>2.0</b>  | <b>5.0</b>  | <b>10</b>  | <b>ug/L</b> | 10              | 28-Oct-2018 20:31 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| <b>1,2-Dichloroethane</b>             | <b>43</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:04 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:04 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW13-181023  
 Collection Date: 23-Oct-2018 09:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-04  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL | DL                    | LOD         | LOQ           | UNITS       | DILUTION FACTOR | DATE ANALYZED            |
|---------------------------------------|-------------|------|-----------------------|-------------|---------------|-------------|-----------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             |      | <b>Method:SW8260</b>  |             |               |             | Analyst: AKP    |                          |
| <b>Chloroform</b>                     | <b>1.4</b>  |      | <b>0.20</b>           | <b>0.50</b> | <b>1.0</b>    | <b>ug/L</b> | 1               | 28-Oct-2018 20:04        |
| Chloromethane                         | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| <b>cis-1,2-Dichloroethene</b>         | <b>1.9</b>  |      | <b>0.20</b>           | <b>0.50</b> | <b>1.0</b>    | <b>ug/L</b> | 1               | 28-Oct-2018 20:04        |
| cis-1,3-Dichloropropene               | 0.50        | U    | 0.10                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Dibromochloromethane                  | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Dibromomethane                        | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Dichlorodifluoromethane               | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Ethylbenzene                          | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Hexachlorobutadiene                   | 1.0         | U    | 1.0                   | 1.0         | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Isopropylbenzene                      | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| m,p-Xylene                            | 1.0         | U    | 0.50                  | 1.0         | 2.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Methylene chloride                    | 1.0         | U    | 1.0                   | 1.0         | 2.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| n-Butylbenzene                        | 0.50        | U    | 0.40                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| n-Propylbenzene                       | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Naphthalene                           | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| o-Xylene                              | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| sec-Butylbenzene                      | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Styrene                               | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| tert-Butylbenzene                     | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Tetrachloroethene                     | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Toluene                               | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| trans-1,2-Dichloroethene              | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| trans-1,3-Dichloropropene             | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| <b>Trichloroethene</b>                | <b>2.4</b>  |      | <b>0.20</b>           | <b>0.50</b> | <b>1.0</b>    | <b>ug/L</b> | 1               | 28-Oct-2018 20:04        |
| Trichlorofluoromethane                | 0.50        | U    | 0.30                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| Vinyl chloride                        | 0.50        | U    | 0.20                  | 0.50        | 1.0           | ug/L        | 1               | 28-Oct-2018 20:04        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>94.6</i> |      |                       | <b>0</b>    | <i>70-126</i> | <b>%REC</b> | <i>1</i>        | <i>28-Oct-2018 20:04</i> |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>95.7</i> |      |                       | <b>0</b>    | <i>70-126</i> | <b>%REC</b> | <i>10</i>       | <i>28-Oct-2018 20:31</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.6</i> |      |                       | <b>0</b>    | <i>81-113</i> | <b>%REC</b> | <i>1</i>        | <i>28-Oct-2018 20:04</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>100</i>  |      |                       | <b>0</b>    | <i>81-113</i> | <b>%REC</b> | <i>10</i>       | <i>28-Oct-2018 20:31</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>95.2</i> |      |                       | <b>0</b>    | <i>77-123</i> | <b>%REC</b> | <i>10</i>       | <i>28-Oct-2018 20:31</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>95.5</i> |      |                       | <b>0</b>    | <i>77-123</i> | <b>%REC</b> | <i>1</i>        | <i>28-Oct-2018 20:04</i> |
| <i>Surr: Toluene-d8</i>               | <i>93.3</i> |      |                       | <b>0</b>    | <i>82-127</i> | <b>%REC</b> | <i>1</i>        | <i>28-Oct-2018 20:04</i> |
| <i>Surr: Toluene-d8</i>               | <i>93.9</i> |      |                       | <b>0</b>    | <i>82-127</i> | <b>%REC</b> | <i>10</i>       | <i>28-Oct-2018 20:31</i> |
| <b>SULFIDE BY E376.1</b>              |             |      | <b>Method:E376.1</b>  |             |               |             | Analyst: KVL    |                          |
| <b>Sulfide</b>                        | <b>2.28</b> |      | <b>1.00</b>           | <b>1.00</b> | <b>1.00</b>   | <b>mg/L</b> | 1               | 27-Oct-2018 14:00        |
| <b>ALKALINITY BY SM2320B</b>          |             |      | <b>Method:SM2320B</b> |             |               |             | Analyst: AJH    |                          |
| <b>Alkalinity, Total (As CaCO3)</b>   | <b>368</b>  |      | <b>5.00</b>           | <b>5.00</b> | <b>5.00</b>   | <b>mg/L</b> | 1               | 27-Oct-2018 18:10        |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW13-181023  
 Collection Date: 23-Oct-2018 09:35

**ANALYTICAL REPORT**

WorkOrder:HS18101278  
 Lab ID:HS18101278-04  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL                    | DL     | LOD    | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--|--------------|-------------------------|--------|--------|--------|-------|--------------------|-------------------|
| <b>FERROUS IRON BY SM3500 FE D</b>         |              | <b>Method:SM3500FED</b> |        |        |        |       | Analyst: MZD       |                   |
| Ferrous Iron                               | 0.0350       | Jn                      | 0.0200 | 0.0500 | 0.0500 | mg/L  | 1                  | 24-Oct-2018 10:44 |
| <b>ANIONS BY SW9056A</b>                   |              | <b>Method:SW9056</b>    |        |        |        |       | Analyst: KMU       |                   |
| Chloride                                   | 1,420        |                         | 4.00   | 10.0   | 10.0   | mg/L  | 20                 | 24-Oct-2018 21:32 |
| Nitrogen, Nitrate (As N)                   | 0.200        | U                       | 0.0600 | 0.200  | 0.200  | mg/L  | 2                  | 24-Oct-2018 21:18 |
| Nitrogen, Nitrite (As N)                   | 0.200        | U                       | 0.0600 | 0.200  | 0.200  | mg/L  | 2                  | 24-Oct-2018 21:18 |
| Sulfate                                    | 355          |                         | 4.00   | 10.0   | 10.0   | mg/L  | 20                 | 24-Oct-2018 21:32 |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              | <b>Method:NA</b>        |        |        |        |       | Analyst: SUB       |                   |
| Subcontract Analysis                       | See Attached |                         | 0      | 0      |        |       | 1                  | 31-Oct-2018 16:29 |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              | <b>Method:NA</b>        |        |        |        |       | Analyst: SUBK      |                   |
| Subcontract Analysis                       | See Attached |                         | 0      | 0      |        | NA    | 1                  | 30-Nov-2018 19:57 |
| <b>SUBCONTRACTED ANALYSIS</b>              |              | <b>Method:NA</b>        |        |        |        |       | Analyst: SUBK      |                   |
| Miscellaneous Analysis                     | See Attached |                         | 0      | 0      |        | NA    | 1                  | 30-Nov-2018 19:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023  
 Collection Date: 23-Oct-2018 10:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-05  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,1,2-Trichloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| <b>1,1-Dichloroethane</b>             | <b>12</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 16:00 |
| <b>1,1-Dichloroethene</b>             | <b>160</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 16:00 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| <b>1,2-Dichloroethane</b>             | <b>6.5</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 16:00 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:00 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023  
 Collection Date: 23-Oct-2018 10:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-05  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL | DL                      | LOD    | LOQ    | UNITS | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|--------|------|-------------------------|--------|--------|-------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        |      | <b>Method:SW8260</b>    |        |        |       |                 | Analyst: AKP      |
| Chloroform                            | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Chloromethane                         | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| cis-1,2-Dichloroethene                | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| cis-1,3-Dichloropropene               | 0.50   | U    | 0.10                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Dibromochloromethane                  | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Dibromomethane                        | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Dichlorodifluoromethane               | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Ethylbenzene                          | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Hexachlorobutadiene                   | 1.0    | U    | 1.0                     | 1.0    | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Isopropylbenzene                      | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| m,p-Xylene                            | 1.0    | U    | 0.50                    | 1.0    | 2.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Methylene chloride                    | 1.0    | U    | 1.0                     | 1.0    | 2.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| n-Butylbenzene                        | 0.50   | U    | 0.40                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| n-Propylbenzene                       | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Naphthalene                           | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| o-Xylene                              | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| sec-Butylbenzene                      | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Styrene                               | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| tert-Butylbenzene                     | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Tetrachloroethene                     | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Toluene                               | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| trans-1,2-Dichloroethene              | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| trans-1,3-Dichloropropene             | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Trichloroethene                       | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Trichlorofluoromethane                | 0.50   | U    | 0.30                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Vinyl chloride                        | 0.50   | U    | 0.20                    | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:00 |
| Surr: 1,2-Dichloroethane-d4           | 95.0   |      |                         | 0      | 70-126 | %REC  | 1               | 28-Oct-2018 16:00 |
| Surr: 4-Bromofluorobenzene            | 98.9   |      |                         | 0      | 81-113 | %REC  | 1               | 28-Oct-2018 16:00 |
| Surr: Dibromofluoromethane            | 97.1   |      |                         | 0      | 77-123 | %REC  | 1               | 28-Oct-2018 16:00 |
| Surr: Toluene-d8                      | 92.1   |      |                         | 0      | 82-127 | %REC  | 1               | 28-Oct-2018 16:00 |
| <b>SULFIDE BY E376.1</b>              |        |      | <b>Method:E376.1</b>    |        |        |       |                 | Analyst: KVL      |
| Sulfide                               | 1.00   | U    | 1.00                    | 1.00   | 1.00   | mg/L  | 1               | 27-Oct-2018 14:00 |
| <b>ALKALINITY BY SM2320B</b>          |        |      | <b>Method:SM2320B</b>   |        |        |       |                 | Analyst: AJH      |
| Alkalinity, Total (As CaCO3)          | 220    |      | 5.00                    | 5.00   | 5.00   | mg/L  | 1               | 27-Oct-2018 18:16 |
| <b>FERROUS IRON BY SM3500 FE D</b>    |        |      | <b>Method:SM3500FED</b> |        |        |       |                 | Analyst: MZD      |
| Ferrous Iron                          | 0.343  | n    | 0.0200                  | 0.0500 | 0.0500 | mg/L  | 1               | 24-Oct-2018 10:44 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023  
 Collection Date: 23-Oct-2018 10:45

**ANALYTICAL REPORT**

WorkOrder:HS18101278  
 Lab ID:HS18101278-05  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL                 | DL          | LOD         | LOQ         | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--|--------------|----------------------|-------------|-------------|-------------|-------------|--------------------|-------------------|
| <b>ANIONS BY SW9056A</b>                   |              | <b>Method:SW9056</b> |             |             |             |             | Analyst: KMU       |                   |
| <b>Chloride</b>                            | <b>1,820</b> |                      | <b>4.00</b> | <b>10.0</b> | <b>10.0</b> | <b>mg/L</b> | 20                 | 24-Oct-2018 22:02 |
| Nitrogen, Nitrate (As N)                   | 0.200        | U                    | 0.0600      | 0.200       | 0.200       | mg/L        | 2                  | 24-Oct-2018 21:47 |
| Nitrogen, Nitrite (As N)                   | 0.200        | U                    | 0.0600      | 0.200       | 0.200       | mg/L        | 2                  | 24-Oct-2018 21:47 |
| <b>Sulfate</b>                             | <b>499</b>   |                      | <b>4.00</b> | <b>10.0</b> | <b>10.0</b> | <b>mg/L</b> | 20                 | 24-Oct-2018 22:02 |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUB       |                   |
| Subcontract Analysis                       | See Attached |                      | 0           | 0           |             |             | 1                  | 31-Oct-2018 16:29 |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUBK      |                   |
| Subcontract Analysis                       | See Attached |                      | 0           | 0           |             | NA          | 1                  | 30-Nov-2018 19:57 |
| <b>SUBCONTRACTED ANALYSIS</b>              |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUBK      |                   |
| Miscellaneous Analysis                     | See Attached |                      | 0           | 0           |             | NA          | 1                  | 30-Nov-2018 19:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023-FD  
 Collection Date: 23-Oct-2018 10:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-06  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL | DL                   | LOD         | LOQ        | UNITS        | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|------|----------------------|-------------|------------|--------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            |      | <b>Method:SW8260</b> |             |            | Analyst: AKP |                 |                   |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,1,1-Trichloroethane                 | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane  | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,1,2-Trichloroethane                 | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| <b>1,1-Dichloroethane</b>             | <b>12</b>  |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b>  | 1               | 28-Oct-2018 16:24 |
| <b>1,1-Dichloroethene</b>             | <b>160</b> |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b>  | 1               | 28-Oct-2018 16:24 |
| 1,1-Dichloropropene                   | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2,3-Trichlorobenzene                | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2,3-Trichloropropane                | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2,4-Trichlorobenzene                | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2,4-Trimethylbenzene                | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U    | 1.0                  | 1.0         | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2-Dibromoethane                     | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,2-Dichlorobenzene                   | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| <b>1,2-Dichloroethane</b>             | <b>6.2</b> |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b>  | 1               | 28-Oct-2018 16:24 |
| 1,2-Dichloropropane                   | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,3,5-Trimethylbenzene                | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,3-Dichlorobenzene                   | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,3-Dichloropropane                   | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 1,4-Dichlorobenzene                   | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 2,2-Dichloropropane                   | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 2-Butanone                            | 1.0        | U    | 0.50                 | 1.0         | 2.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 2-Chlorotoluene                       | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 2-Hexanone                            | 1.0        | U    | 1.0                  | 1.0         | 2.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 4-Chlorotoluene                       | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 4-Isopropyltoluene                    | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| 4-Methyl-2-pentanone                  | 1.0        | U    | 0.70                 | 1.0         | 2.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Acetone                               | 2.0        | U    | 2.0                  | 2.0         | 2.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Benzene                               | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Bromobenzene                          | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Bromochloromethane                    | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Bromodichloromethane                  | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Bromoform                             | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Bromomethane                          | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Carbon disulfide                      | 1.0        | U    | 0.60                 | 1.0         | 2.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Carbon tetrachloride                  | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Chlorobenzene                         | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |
| Chloroethane                          | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L         | 1               | 28-Oct-2018 16:24 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023-FD  
 Collection Date: 23-Oct-2018 10:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-06  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                    | DL     | LOD    | LOQ    | UNITS | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|--------|-------------------------|--------|--------|--------|-------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b>    |        |        |        |       |                 | Analyst: AKP      |
| Chloroform                            | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Chloromethane                         | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| cis-1,2-Dichloroethene                | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| cis-1,3-Dichloropropene               | 0.50   | U                       | 0.10   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Dibromochloromethane                  | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Dibromomethane                        | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Dichlorodifluoromethane               | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Ethylbenzene                          | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Hexachlorobutadiene                   | 1.0    | U                       | 1.0    | 1.0    | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Isopropylbenzene                      | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| m,p-Xylene                            | 1.0    | U                       | 0.50   | 1.0    | 2.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Methylene chloride                    | 1.0    | U                       | 1.0    | 1.0    | 2.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| n-Butylbenzene                        | 0.50   | U                       | 0.40   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| n-Propylbenzene                       | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Naphthalene                           | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| o-Xylene                              | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| sec-Butylbenzene                      | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Styrene                               | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| tert-Butylbenzene                     | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Tetrachloroethene                     | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Toluene                               | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| trans-1,2-Dichloroethene              | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| trans-1,3-Dichloropropene             | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Trichloroethene                       | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Trichlorofluoromethane                | 0.50   | U                       | 0.30   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Vinyl chloride                        | 0.50   | U                       | 0.20   | 0.50   | 1.0    | ug/L  | 1               | 28-Oct-2018 16:24 |
| Surr: 1,2-Dichloroethane-d4           | 97.7   |                         |        | 0      | 70-126 | %REC  | 1               | 28-Oct-2018 16:24 |
| Surr: 4-Bromofluorobenzene            | 99.0   |                         |        | 0      | 81-113 | %REC  | 1               | 28-Oct-2018 16:24 |
| Surr: Dibromofluoromethane            | 96.1   |                         |        | 0      | 77-123 | %REC  | 1               | 28-Oct-2018 16:24 |
| Surr: Toluene-d8                      | 92.8   |                         |        | 0      | 82-127 | %REC  | 1               | 28-Oct-2018 16:24 |
| <b>SULFIDE BY E376.1</b>              |        | <b>Method:E376.1</b>    |        |        |        |       |                 | Analyst: KVL      |
| Sulfide                               | 1.00   | U                       | 1.00   | 1.00   | 1.00   | mg/L  | 1               | 27-Oct-2018 14:00 |
| <b>ALKALINITY BY SM2320B</b>          |        | <b>Method:SM2320B</b>   |        |        |        |       |                 | Analyst: AJH      |
| Alkalinity, Total (As CaCO3)          | 221    |                         | 5.00   | 5.00   | 5.00   | mg/L  | 1               | 27-Oct-2018 18:22 |
| <b>FERROUS IRON BY SM3500 FE D</b>    |        | <b>Method:SM3500FED</b> |        |        |        |       |                 | Analyst: MZD      |
| Ferrous Iron                          | 0.270  | n                       | 0.0200 | 0.0500 | 0.0500 | mg/L  | 1               | 24-Oct-2018 10:44 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW08-181023-FD  
 Collection Date: 23-Oct-2018 10:45

**ANALYTICAL REPORT**

WorkOrder:HS18101278  
 Lab ID:HS18101278-06  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL                 | DL          | LOD         | LOQ         | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--|--------------|----------------------|-------------|-------------|-------------|-------------|--------------------|-------------------|
| <b>ANIONS BY SW9056A</b>                   |              | <b>Method:SW9056</b> |             |             |             |             | Analyst: KMU       |                   |
| <b>Chloride</b>                            | <b>1,770</b> |                      | <b>4.00</b> | <b>10.0</b> | <b>10.0</b> | <b>mg/L</b> | 20                 | 24-Oct-2018 22:31 |
| Nitrogen, Nitrate (As N)                   | 0.200        | U                    | 0.0600      | 0.200       | 0.200       | mg/L        | 2                  | 24-Oct-2018 22:16 |
| Nitrogen, Nitrite (As N)                   | 0.200        | U                    | 0.0600      | 0.200       | 0.200       | mg/L        | 2                  | 24-Oct-2018 22:16 |
| <b>Sulfate</b>                             | <b>489</b>   |                      | <b>4.00</b> | <b>10.0</b> | <b>10.0</b> | <b>mg/L</b> | 20                 | 24-Oct-2018 22:31 |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUB       |                   |
| Subcontract Analysis                       | See Attached |                      | 0           | 0           |             |             | 1                  | 31-Oct-2018 16:29 |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUBK      |                   |
| Subcontract Analysis                       | See Attached |                      | 0           | 0           |             | NA          | 1                  | 30-Nov-2018 19:57 |
| <b>SUBCONTRACTED ANALYSIS</b>              |              | <b>Method:NA</b>     |             |             |             |             | Analyst: SUBK      |                   |
| Miscellaneous Analysis                     | See Attached |                      | 0           | 0           |             | NA          | 1                  | 30-Nov-2018 19:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW11-181023  
 Collection Date: 23-Oct-2018 11:55

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-07  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL | DL                   | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|------|----------------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            |      | <b>Method:SW8260</b> |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,1,1-Trichloroethane                 | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane  | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,1,2-Trichloroethane                 | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| <b>1,1-Dichloroethane</b>             | <b>3.8</b> |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 16:48 |
| <b>1,1-Dichloroethene</b>             | <b>6.1</b> |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 16:48 |
| 1,1-Dichloropropene                   | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2,3-Trichlorobenzene                | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2,3-Trichloropropane                | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2,4-Trichlorobenzene                | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2,4-Trimethylbenzene                | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U    | 1.0                  | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2-Dibromoethane                     | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2-Dichlorobenzene                   | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2-Dichloroethane                    | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,2-Dichloropropane                   | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,3,5-Trimethylbenzene                | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,3-Dichlorobenzene                   | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,3-Dichloropropane                   | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 1,4-Dichlorobenzene                   | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 2,2-Dichloropropane                   | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 2-Butanone                            | 1.0        | U    | 0.50                 | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 2-Chlorotoluene                       | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 2-Hexanone                            | 1.0        | U    | 1.0                  | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 4-Chlorotoluene                       | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 4-Isopropyltoluene                    | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| 4-Methyl-2-pentanone                  | 1.0        | U    | 0.70                 | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Acetone                               | 2.0        | U    | 2.0                  | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Benzene                               | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Bromobenzene                          | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Bromochloromethane                    | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Bromodichloromethane                  | 0.50       | U    | 0.20                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Bromoform                             | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Bromomethane                          | 0.50       | U    | 0.40                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Carbon disulfide                      | 1.0        | U    | 0.60                 | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Carbon tetrachloride                  | 0.50       | U    | 0.50                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Chlorobenzene                         | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |
| Chloroethane                          | 0.50       | U    | 0.30                 | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 16:48 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW11-181023  
 Collection Date: 23-Oct-2018 11:55

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-07  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 16:48 |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | 96.3   |                      |      | 0    | 70-126 | %REC  | 1                  | 28-Oct-2018 16:48 |
| <i>Surr: 4-Bromofluorobenzene</i>     | 98.4   |                      |      | 0    | 81-113 | %REC  | 1                  | 28-Oct-2018 16:48 |
| <i>Surr: Dibromofluoromethane</i>     | 98.3   |                      |      | 0    | 77-123 | %REC  | 1                  | 28-Oct-2018 16:48 |
| <i>Surr: Toluene-d8</i>               | 92.4   |                      |      | 0    | 82-127 | %REC  | 1                  | 28-Oct-2018 16:48 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW09-181023  
 Collection Date: 23-Oct-2018 12:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-08  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|--------|----------------------|------|------|-----|-------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 28-Oct-2018 17:13 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW09-181023  
 Collection Date: 23-Oct-2018 12:45

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-08  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 28-Oct-2018 17:13 |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | 96.5   |                      |      | 0    | 70-126 | %REC  | 1                  | 28-Oct-2018 17:13 |
| <i>Surr: 4-Bromofluorobenzene</i>     | 98.1   |                      |      | 0    | 81-113 | %REC  | 1                  | 28-Oct-2018 17:13 |
| <i>Surr: Dibromofluoromethane</i>     | 97.5   |                      |      | 0    | 77-123 | %REC  | 1                  | 28-Oct-2018 17:13 |
| <i>Surr: Toluene-d8</i>               | 92.6   |                      |      | 0    | 82-127 | %REC  | 1                  | 28-Oct-2018 17:13 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW15-181023  
 Collection Date: 23-Oct-2018 13:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-09  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| <b>1,1,2-Trichloroethane</b>          | <b>6.0</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:56 |
| <b>1,1-Dichloroethane</b>             | <b>13</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:56 |
| <b>1,1-Dichloroethene</b>             | <b>670</b> |                      | <b>2.0</b>  | <b>5.0</b>  | <b>10</b>  | <b>ug/L</b> | 10              | 28-Oct-2018 21:23 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| <b>1,2-Dichloroethane</b>             | <b>30</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1               | 28-Oct-2018 20:56 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1               | 28-Oct-2018 20:56 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: LHAAP-67  
 Sample ID: 67WW15-181023  
 Collection Date: 23-Oct-2018 13:35

## ANALYTICAL REPORT

WorkOrder:HS18101278  
 Lab ID:HS18101278-09  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL          | LOD         | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|-------------|-------------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |             |             |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Chloromethane                         | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| <b>cis-1,2-Dichloroethene</b>         | <b>1.7</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>ug/L</b> | 1                  | 28-Oct-2018 20:56        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Dibromomethane                        | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Ethylbenzene                          | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0         | 1.0         | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| m,p-Xylene                            | 1.0         | U                    | 0.50        | 1.0         | 2.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Methylene chloride                    | 1.0         | U                    | 1.0         | 1.0         | 2.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Naphthalene                           | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| o-Xylene                              | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Styrene                               | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Toluene                               | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| <b>Trichloroethene</b>                | <b>1.4</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>ug/L</b> | 1                  | 28-Oct-2018 20:56        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| Vinyl chloride                        | 0.50        | U                    | 0.20        | 0.50        | 1.0           | ug/L        | 1                  | 28-Oct-2018 20:56        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>94.7</i> |                      |             | <b>0</b>    | <i>70-126</i> | <b>%REC</b> | <i>10</i>          | <i>28-Oct-2018 21:23</i> |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>98.2</i> |                      |             | <b>0</b>    | <i>70-126</i> | <b>%REC</b> | <i>1</i>           | <i>28-Oct-2018 20:56</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>101</i>  |                      |             | <b>0</b>    | <i>81-113</i> | <b>%REC</b> | <i>1</i>           | <i>28-Oct-2018 20:56</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.4</i> |                      |             | <b>0</b>    | <i>81-113</i> | <b>%REC</b> | <i>10</i>          | <i>28-Oct-2018 21:23</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>97.0</i> |                      |             | <b>0</b>    | <i>77-123</i> | <b>%REC</b> | <i>10</i>          | <i>28-Oct-2018 21:23</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>98.8</i> |                      |             | <b>0</b>    | <i>77-123</i> | <b>%REC</b> | <i>1</i>           | <i>28-Oct-2018 20:56</i> |
| <i>Surr: Toluene-d8</i>               | <i>93.1</i> |                      |             | <b>0</b>    | <i>82-127</i> | <b>%REC</b> | <i>1</i>           | <i>28-Oct-2018 20:56</i> |
| <i>Surr: Toluene-d8</i>               | <i>91.0</i> |                      |             | <b>0</b>    | <i>82-127</i> | <b>%REC</b> | <i>10</i>          | <i>28-Oct-2018 21:23</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

**DATES REPORT**

| Sample ID               | Client Samp ID                                    | Collection Date   | TCLP Date | Prep Date                  | Analysis Date     | DF |
|-------------------------|---|-------------------|-----------|----------------------------|-------------------|----|
| <b>Batch ID</b> R326268 | <b>Test Name :</b> FERROUS IRON BY SM3500 FE D    |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 24 Oct 2018 10:44 | 1  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 10:44 | 1  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 10:44 | 1  |
| <b>Batch ID</b> R326270 | <b>Test Name :</b> SULFIDE BY E376.1              |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 27 Oct 2018 14:00 | 1  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 27 Oct 2018 14:00 | 1  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 27 Oct 2018 14:00 | 1  |
| <b>Batch ID</b> R326282 | <b>Test Name :</b> ALKALINITY BY SM2320B          |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 27 Oct 2018 18:10 | 1  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 27 Oct 2018 18:16 | 1  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 27 Oct 2018 18:22 | 1  |
| <b>Batch ID</b> R326371 | <b>Test Name :</b> LOW LEVEL VOLATILES BY SW8260C |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-01           | 67WW14-181022                                     | 22 Oct 2018 12:55 |           |                            | 28 Oct 2018 13:33 | 1  |
| HS18101278-02           | 67WW12-181022                                     | 22 Oct 2018 13:45 |           |                            | 28 Oct 2018 15:11 | 1  |
| HS18101278-03           | 67WW10-181022                                     | 22 Oct 2018 14:35 |           |                            | 28 Oct 2018 15:35 | 1  |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 28 Oct 2018 20:31 | 10 |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 28 Oct 2018 20:04 | 1  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 28 Oct 2018 16:00 | 1  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 28 Oct 2018 16:24 | 1  |
| HS18101278-07           | 67WW11-181023                                     | 23 Oct 2018 11:55 |           |                            | 28 Oct 2018 16:48 | 1  |
| HS18101278-08           | 67WW09-181023                                     | 23 Oct 2018 12:45 |           |                            | 28 Oct 2018 17:13 | 1  |
| HS18101278-09           | 67WW15-181023                                     | 23 Oct 2018 13:35 |           |                            | 28 Oct 2018 21:23 | 10 |
| HS18101278-09           | 67WW15-181023                                     | 23 Oct 2018 13:35 |           |                            | 28 Oct 2018 20:56 | 1  |
| <b>Batch ID</b> R326431 | <b>Test Name :</b> ANIONS BY SW9056A              |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 24 Oct 2018 21:32 | 20 |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 24 Oct 2018 21:18 | 2  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 22:02 | 20 |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 21:47 | 2  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 22:31 | 20 |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 24 Oct 2018 22:16 | 2  |
| <b>Batch ID</b> R326554 | <b>Test Name :</b> SUBCONTRACT ANALYSIS - RSK     |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101278-04           | 67WW13-181023                                     | 23 Oct 2018 09:35 |           |                            | 31 Oct 2018 16:29 | 1  |
| HS18101278-05           | 67WW08-181023                                     | 23 Oct 2018 10:45 |           |                            | 31 Oct 2018 16:29 | 1  |
| HS18101278-06           | 67WW08-181023-FD                                  | 23 Oct 2018 10:45 |           |                            | 31 Oct 2018 16:29 | 1  |

ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

**DATES REPORT**

| Sample ID       | Client Samp ID   | Collection Date                           | TCLP Date | Prep Date | Analysis Date              | DF |
|-----------------|------------------|---|-----------|-----------|----------------------------|----|
| <b>Batch ID</b> | <b>R328436</b>   | <b>Test Name : SUBCONTRACTED ANALYSIS</b> |           |           | <b>Matrix: Groundwater</b> |    |
| HS18101278-04   | 67WW13-181023    | 23 Oct 2018 09:35                         |           |           | 30 Nov 2018 19:57          | 1  |
| HS18101278-04   | 67WW13-181023    | 23 Oct 2018 09:35                         |           |           | 30 Nov 2018 19:57          | 1  |
| HS18101278-05   | 67WW08-181023    | 23 Oct 2018 10:45                         |           |           | 30 Nov 2018 19:57          | 1  |
| HS18101278-05   | 67WW08-181023    | 23 Oct 2018 10:45                         |           |           | 30 Nov 2018 19:57          | 1  |
| HS18101278-06   | 67WW08-181023-FD | 23 Oct 2018 10:45                         |           |           | 30 Nov 2018 19:57          | 1  |
| HS18101278-06   | 67WW08-181023-FD | 23 Oct 2018 10:45                         |           |           | 30 Nov 2018 19:57          | 1  |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371                    |                         | Instrument: VOA2 |         | Method: SW8260                   |      |               |               |      |                |
|--------------------------------------|-------------------------|------------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| MBLK                                 | Sample ID: VBLKW-181028 | Units: ug/L      |         | Analysis Date: 28-Oct-2018 12:44 |      |               |               |      |                |
| Client ID:                           | Run ID: VOA2_326371     | SeqNo: 4795123   |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                              | Result                  | PQL              | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1,1-Trichloroethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1,2,2-Tetrachloroethane            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1,2-Trichloroethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1-Dichloroethane                   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1-Dichloroethene                   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,1-Dichloropropene                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2,3-Trichlorobenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2,3-Trichloropropane               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2,4-Trichlorobenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2,4-Trimethylbenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2-Dibromo-3-chloropropane          | 1.0                     | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2-Dibromoethane                    | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2-Dichlorobenzene                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2-Dichloroethane                   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,2-Dichloropropane                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,3,5-Trimethylbenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,3-Dichlorobenzene                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,3-Dichloropropane                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 1,4-Dichlorobenzene                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 2,2-Dichloropropane                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 2-Butanone                           | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| 2-Chlorotoluene                      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 2-Hexanone                           | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| 4-Chlorotoluene                      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 4-Isopropyltoluene                   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| 4-Methyl-2-pentanone                 | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Acetone                              | 2.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Benzene                              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Bromobenzene                         | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Bromochloromethane                   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Bromodichloromethane                 | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Bromoform                            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371           |                         | Instrument: VOA2 |         | Method: SW8260                   |      |               |               |      |                |
|-----------------------------|-------------------------|------------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| MBLK                        | Sample ID: VBLKW-181028 | Units: ug/L      |         | Analysis Date: 28-Oct-2018 12:44 |      |               |               |      |                |
| Client ID:                  | Run ID: VOA2_326371     | SeqNo: 4795123   |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                     | Result                  | PQL              | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Bromomethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Carbon disulfide            | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Carbon tetrachloride        | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chlorobenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloroethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloroform                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloromethane               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| cis-1,2-Dichloroethene      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| cis-1,3-Dichloropropene     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dibromochloromethane        | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dibromomethane              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dichlorodifluoromethane     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Ethylbenzene                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Hexachlorobutadiene         | 1.0                     | 1.0              |         |                                  |      |               |               |      | U              |
| Isopropylbenzene            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| m,p-Xylene                  | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Methylene chloride          | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Naphthalene                 | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| n-Butylbenzene              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| n-Propylbenzene             | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| o-Xylene                    | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| sec-Butylbenzene            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Styrene                     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| tert-Butylbenzene           | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Tetrachloroethene           | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Toluene                     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| trans-1,2-Dichloroethene    | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| trans-1,3-Dichloropropene   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Trichloroethene             | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Trichlorofluoromethane      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Vinyl chloride              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Surr: 1,2-Dichloroethane-d4 | 47.49                   | 1.0              | 50      | 0                                | 95.0 | 70 - 123      |               |      |                |
| Surr: 4-Bromofluorobenzene  | 49.34                   | 1.0              | 50      | 0                                | 98.7 | 82 - 115      |               |      |                |
| Surr: Dibromofluoromethane  | 48.3                    | 1.0              | 50      | 0                                | 96.6 | 73 - 126      |               |      |                |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371 |                         | Instrument: VOA2 |         | Method: SW8260 |                                  |               |               |      |           |      |
|-------------------|-------------------------|------------------|---------|----------------|----------------------------------|---------------|---------------|------|-----------|------|
| MBLK              | Sample ID: VBLKW-181028 | Units: ug/L      |         |                | Analysis Date: 28-Oct-2018 12:44 |               |               |      |           |      |
| Client ID:        | Run ID: VOA2_326371     | SeqNo: 4795123   |         | PrepDate:      |                                  | DF: 1         |               |      |           |      |
| Analyte           | Result                  | PQL              | SPK Val | SPK Ref Value  | %REC                             | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Surr: Toluene-d8  | 45.74                   | 1.0              | 50      | 0              | 91.5                             | 81 - 120      |               |      |           |      |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371                    |        | Instrument: VOA2        |         | Method: SW8260 |      |                                  |               |       |           |      |
|--------------------------------------|--------|-------------------------|---------|----------------|------|----------------------------------|---------------|-------|-----------|------|
| LCS                                  |        | Sample ID: VLCSW-181028 |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 11:55 |               |       |           |      |
| Client ID:                           |        | Run ID: VOA2_326371     |         | SeqNo: 4795121 |      | PrepDate:                        |               | DF: 1 |           |      |
| Analyte                              | Result | PQL                     | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit | Qual |
| 1,1,1,2-Tetrachloroethane            | 20.28  | 1.0                     | 20      | 0              | 101  | 77 - 118                         |               |       |           |      |
| 1,1,1-Trichloroethane                | 19.78  | 1.0                     | 20      | 0              | 98.9 | 70 - 130                         |               |       |           |      |
| 1,1,2,2-Tetrachloroethane            | 17.71  | 1.0                     | 20      | 0              | 88.5 | 70 - 120                         |               |       |           |      |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 24.98  | 1.0                     | 20      | 0              | 125  | 70 - 130                         |               |       |           |      |
| 1,1,2-Trichloroethane                | 20.01  | 1.0                     | 20      | 0              | 100  | 77 - 113                         |               |       |           |      |
| 1,1-Dichloroethane                   | 20.55  | 1.0                     | 20      | 0              | 103  | 71 - 122                         |               |       |           |      |
| 1,1-Dichloroethene                   | 20.68  | 1.0                     | 20      | 0              | 103  | 70 - 130                         |               |       |           |      |
| 1,1-Dichloropropene                  | 22.76  | 1.0                     | 20      | 0              | 114  | 78 - 118                         |               |       |           |      |
| 1,2,3-Trichlorobenzene               | 17.82  | 1.0                     | 20      | 0              | 89.1 | 70 - 130                         |               |       |           |      |
| 1,2,3-Trichloropropane               | 17.75  | 1.0                     | 20      | 0              | 88.7 | 70 - 127                         |               |       |           |      |
| 1,2,4-Trichlorobenzene               | 19.12  | 1.0                     | 20      | 0              | 95.6 | 77 - 126                         |               |       |           |      |
| 1,2,4-Trimethylbenzene               | 20.82  | 1.0                     | 20      | 0              | 104  | 73 - 121                         |               |       |           |      |
| 1,2-Dibromo-3-chloropropane          | 17.12  | 1.0                     | 20      | 0              | 85.6 | 70 - 130                         |               |       |           |      |
| 1,2-Dibromoethane                    | 20.55  | 1.0                     | 20      | 0              | 103  | 76 - 123                         |               |       |           |      |
| 1,2-Dichlorobenzene                  | 19.11  | 1.0                     | 20      | 0              | 95.5 | 77 - 113                         |               |       |           |      |
| 1,2-Dichloroethane                   | 21.11  | 1.0                     | 20      | 0              | 106  | 70 - 124                         |               |       |           |      |
| 1,2-Dichloropropane                  | 21.81  | 1.0                     | 20      | 0              | 109  | 72 - 119                         |               |       |           |      |
| 1,3,5-Trimethylbenzene               | 18.88  | 1.0                     | 20      | 0              | 94.4 | 75 - 118                         |               |       |           |      |
| 1,3-Dichlorobenzene                  | 19.79  | 1.0                     | 20      | 0              | 99.0 | 78 - 118                         |               |       |           |      |
| 1,3-Dichloropropane                  | 20.5   | 1.0                     | 20      | 0              | 102  | 75 - 116                         |               |       |           |      |
| 1,4-Dichlorobenzene                  | 19.52  | 1.0                     | 20      | 0              | 97.6 | 79 - 113                         |               |       |           |      |
| 2,2-Dichloropropane                  | 23.92  | 1.0                     | 20      | 0              | 120  | 70 - 130                         |               |       |           |      |
| 2-Butanone                           | 39.93  | 2.0                     | 40      | 0              | 99.8 | 70 - 130                         |               |       |           |      |
| 2-Chlorotoluene                      | 20.95  | 1.0                     | 20      | 0              | 105  | 70 - 128                         |               |       |           |      |
| 2-Hexanone                           | 39.52  | 2.0                     | 40      | 0              | 98.8 | 70 - 130                         |               |       |           |      |
| 4-Chlorotoluene                      | 21.45  | 1.0                     | 20      | 0              | 107  | 74 - 126                         |               |       |           |      |
| 4-Isopropyltoluene                   | 18.25  | 1.0                     | 20      | 0              | 91.2 | 74 - 126                         |               |       |           |      |
| 4-Methyl-2-pentanone                 | 39.74  | 2.0                     | 40      | 0              | 99.4 | 70 - 130                         |               |       |           |      |
| Acetone                              | 36.05  | 2.0                     | 40      | 0              | 90.1 | 70 - 130                         |               |       |           |      |
| Benzene                              | 20.64  | 1.0                     | 20      | 0              | 103  | 74 - 120                         |               |       |           |      |
| Bromobenzene                         | 19.01  | 1.0                     | 20      | 0              | 95.0 | 78 - 113                         |               |       |           |      |
| Bromochloromethane                   | 20.83  | 1.0                     | 20      | 0              | 104  | 76 - 124                         |               |       |           |      |
| Bromodichloromethane                 | 20.91  | 1.0                     | 20      | 0              | 105  | 74 - 122                         |               |       |           |      |
| Bromoform                            | 19.62  | 1.0                     | 20      | 0              | 98.1 | 73 - 128                         |               |       |           |      |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371           |        | Instrument: VOA2        |         | Method: SW8260 |      |                                  |               |       |           |      |
|-----------------------------|--------|-------------------------|---------|----------------|------|----------------------------------|---------------|-------|-----------|------|
| LCS                         |        | Sample ID: VLCSW-181028 |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 11:55 |               |       |           |      |
| Client ID:                  |        | Run ID: VOA2_326371     |         | SeqNo: 4795121 |      | PrepDate:                        |               | DF: 1 |           |      |
| Analyte                     | Result | PQL                     | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Bromomethane                | 25.33  | 1.0                     | 20      | 0              | 127  | 70 - 130                         |               |       |           |      |
| Carbon disulfide            | 40.66  | 2.0                     | 40      | 0              | 102  | 70 - 130                         |               |       |           |      |
| Carbon tetrachloride        | 21.88  | 1.0                     | 20      | 0              | 109  | 71 - 125                         |               |       |           |      |
| Chlorobenzene               | 20.95  | 1.0                     | 20      | 0              | 105  | 76 - 113                         |               |       |           |      |
| Chloroethane                | 21.5   | 1.0                     | 20      | 0              | 108  | 70 - 130                         |               |       |           |      |
| Chloroform                  | 19.86  | 1.0                     | 20      | 0              | 99.3 | 71 - 121                         |               |       |           |      |
| Chloromethane               | 20.19  | 1.0                     | 20      | 0              | 101  | 70 - 129                         |               |       |           |      |
| cis-1,2-Dichloroethene      | 20.84  | 1.0                     | 20      | 0              | 104  | 75 - 122                         |               |       |           |      |
| cis-1,3-Dichloropropene     | 22.81  | 1.0                     | 20      | 0              | 114  | 73 - 127                         |               |       |           |      |
| Dibromochloromethane        | 19.69  | 1.0                     | 20      | 0              | 98.5 | 77 - 122                         |               |       |           |      |
| Dibromomethane              | 21.53  | 1.0                     | 20      | 0              | 108  | 78 - 121                         |               |       |           |      |
| Dichlorodifluoromethane     | 23.69  | 1.0                     | 20      | 0              | 118  | 70 - 130                         |               |       |           |      |
| Ethylbenzene                | 22.67  | 1.0                     | 20      | 0              | 113  | 77 - 117                         |               |       |           |      |
| Hexachlorobutadiene         | 19.95  | 1.0                     | 20      | 0              | 99.8 | 70 - 130                         |               |       |           |      |
| Isopropylbenzene            | 20.23  | 1.0                     | 20      | 0              | 101  | 73 - 127                         |               |       |           |      |
| m,p-Xylene                  | 45.94  | 2.0                     | 40      | 0              | 115  | 77 - 122                         |               |       |           |      |
| Methylene chloride          | 20.47  | 2.0                     | 20      | 0              | 102  | 70 - 127                         |               |       |           |      |
| Naphthalene                 | 16.57  | 1.0                     | 20      | 0              | 82.8 | 70 - 130                         |               |       |           |      |
| n-Butylbenzene              | 20.88  | 1.0                     | 20      | 0              | 104  | 72 - 130                         |               |       |           |      |
| n-Propylbenzene             | 21.57  | 1.0                     | 20      | 0              | 108  | 73 - 124                         |               |       |           |      |
| o-Xylene                    | 21.9   | 1.0                     | 20      | 0              | 110  | 75 - 119                         |               |       |           |      |
| sec-Butylbenzene            | 18.79  | 1.0                     | 20      | 0              | 93.9 | 73 - 128                         |               |       |           |      |
| Styrene                     | 20.93  | 1.0                     | 20      | 0              | 105  | 72 - 126                         |               |       |           |      |
| tert-Butylbenzene           | 21.09  | 1.0                     | 20      | 0              | 105  | 73 - 124                         |               |       |           |      |
| Tetrachloroethene           | 20.81  | 1.0                     | 20      | 0              | 104  | 76 - 119                         |               |       |           |      |
| Toluene                     | 20.24  | 1.0                     | 20      | 0              | 101  | 77 - 118                         |               |       |           |      |
| trans-1,2-Dichloroethene    | 21.33  | 1.0                     | 20      | 0              | 107  | 72 - 127                         |               |       |           |      |
| trans-1,3-Dichloropropene   | 23.63  | 1.0                     | 20      | 0              | 118  | 77 - 119                         |               |       |           |      |
| Trichloroethene             | 20.26  | 1.0                     | 20      | 0              | 101  | 77 - 121                         |               |       |           |      |
| Trichlorofluoromethane      | 22.99  | 1.0                     | 20      | 0              | 115  | 70 - 130                         |               |       |           |      |
| Vinyl chloride              | 22.49  | 1.0                     | 20      | 0              | 112  | 70 - 130                         |               |       |           |      |
| Surr: 1,2-Dichloroethane-d4 | 51.13  | 1.0                     | 50      | 0              | 102  | 70 - 130                         |               |       |           |      |
| Surr: 4-Bromofluorobenzene  | 52.11  | 1.0                     | 50      | 0              | 104  | 82 - 115                         |               |       |           |      |
| Surr: Dibromofluoromethane  | 48.64  | 1.0                     | 50      | 0              | 97.3 | 73 - 126                         |               |       |           |      |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371 |                         | Instrument: VOA2    |     | Method: SW8260 |                                  |           |               |               |      |                |
|-------------------|-------------------------|---------------------|-----|----------------|----------------------------------|-----------|---------------|---------------|------|----------------|
| LCS               | Sample ID: VLCSW-181028 | Units: ug/L         |     |                | Analysis Date: 28-Oct-2018 11:55 |           |               |               |      |                |
|                   | Client ID:              | Run ID: VOA2_326371 |     | SeqNo: 4795121 |                                  | PrepDate: |               | DF: 1         |      |                |
|                   | Analyte                 | Result              | PQL | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Surr: Toluene-d8  |                         | 45.43               | 1.0 | 50             | 0                                | 90.9      | 81 - 120      |               |      |                |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371                    |        | Instrument: VOA2        |         | Method: SW8260 |      |                                  |               |       |           |      |
|--------------------------------------|--------|-------------------------|---------|----------------|------|----------------------------------|---------------|-------|-----------|------|
| LCS                                  |        | Sample ID: VLCSW-181028 |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 12:19 |               |       |           |      |
| Client ID:                           |        | Run ID: VOA2_326371     |         | SeqNo: 4795122 |      | PrepDate:                        |               | DF: 1 |           |      |
| Analyte                              | Result | PQL                     | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit | Qual |
| 1,1,1,2-Tetrachloroethane            | 20.2   | 1.0                     | 20      | 0              | 101  | 77 - 118                         |               |       |           |      |
| 1,1,1-Trichloroethane                | 18.92  | 1.0                     | 20      | 0              | 94.6 | 70 - 130                         |               |       |           |      |
| 1,1,2,2-Tetrachloroethane            | 18.42  | 1.0                     | 20      | 0              | 92.1 | 70 - 120                         |               |       |           |      |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 22.84  | 1.0                     | 20      | 0              | 114  | 70 - 130                         |               |       |           |      |
| 1,1,2-Trichloroethane                | 20.19  | 1.0                     | 20      | 0              | 101  | 77 - 113                         |               |       |           |      |
| 1,1-Dichloroethane                   | 19.82  | 1.0                     | 20      | 0              | 99.1 | 71 - 122                         |               |       |           |      |
| 1,1-Dichloroethene                   | 20.12  | 1.0                     | 20      | 0              | 101  | 70 - 130                         |               |       |           |      |
| 1,1-Dichloropropene                  | 21.63  | 1.0                     | 20      | 0              | 108  | 78 - 118                         |               |       |           |      |
| 1,2,3-Trichlorobenzene               | 18.28  | 1.0                     | 20      | 0              | 91.4 | 70 - 130                         |               |       |           |      |
| 1,2,3-Trichloropropane               | 18.65  | 1.0                     | 20      | 0              | 93.2 | 70 - 127                         |               |       |           |      |
| 1,2,4-Trichlorobenzene               | 19.58  | 1.0                     | 20      | 0              | 97.9 | 77 - 126                         |               |       |           |      |
| 1,2,4-Trimethylbenzene               | 20.46  | 1.0                     | 20      | 0              | 102  | 73 - 121                         |               |       |           |      |
| 1,2-Dibromo-3-chloropropane          | 17.42  | 1.0                     | 20      | 0              | 87.1 | 70 - 130                         |               |       |           |      |
| 1,2-Dibromoethane                    | 21.21  | 1.0                     | 20      | 0              | 106  | 76 - 123                         |               |       |           |      |
| 1,2-Dichlorobenzene                  | 19.06  | 1.0                     | 20      | 0              | 95.3 | 77 - 113                         |               |       |           |      |
| 1,2-Dichloroethane                   | 21.27  | 1.0                     | 20      | 0              | 106  | 70 - 124                         |               |       |           |      |
| 1,2-Dichloropropane                  | 21.75  | 1.0                     | 20      | 0              | 109  | 72 - 119                         |               |       |           |      |
| 1,3,5-Trimethylbenzene               | 18.72  | 1.0                     | 20      | 0              | 93.6 | 75 - 118                         |               |       |           |      |
| 1,3-Dichlorobenzene                  | 19.66  | 1.0                     | 20      | 0              | 98.3 | 78 - 118                         |               |       |           |      |
| 1,3-Dichloropropane                  | 20.6   | 1.0                     | 20      | 0              | 103  | 75 - 116                         |               |       |           |      |
| 1,4-Dichlorobenzene                  | 20.22  | 1.0                     | 20      | 0              | 101  | 79 - 113                         |               |       |           |      |
| 2,2-Dichloropropane                  | 22.25  | 1.0                     | 20      | 0              | 111  | 70 - 130                         |               |       |           |      |
| 2-Butanone                           | 41.44  | 2.0                     | 40      | 0              | 104  | 70 - 130                         |               |       |           |      |
| 2-Chlorotoluene                      | 20.8   | 1.0                     | 20      | 0              | 104  | 70 - 128                         |               |       |           |      |
| 2-Hexanone                           | 41.46  | 2.0                     | 40      | 0              | 104  | 70 - 130                         |               |       |           |      |
| 4-Chlorotoluene                      | 21.17  | 1.0                     | 20      | 0              | 106  | 74 - 126                         |               |       |           |      |
| 4-Isopropyltoluene                   | 17.9   | 1.0                     | 20      | 0              | 89.5 | 74 - 126                         |               |       |           |      |
| 4-Methyl-2-pentanone                 | 41.92  | 2.0                     | 40      | 0              | 105  | 70 - 130                         |               |       |           |      |
| Acetone                              | 39.22  | 2.0                     | 40      | 0              | 98.1 | 70 - 130                         |               |       |           |      |
| Benzene                              | 20.15  | 1.0                     | 20      | 0              | 101  | 74 - 120                         |               |       |           |      |
| Bromobenzene                         | 19     | 1.0                     | 20      | 0              | 95.0 | 78 - 113                         |               |       |           |      |
| Bromochloromethane                   | 20.18  | 1.0                     | 20      | 0              | 101  | 76 - 124                         |               |       |           |      |
| Bromodichloromethane                 | 21.11  | 1.0                     | 20      | 0              | 106  | 74 - 122                         |               |       |           |      |
| Bromoform                            | 19.76  | 1.0                     | 20      | 0              | 98.8 | 73 - 128                         |               |       |           |      |



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371           |        | Instrument: VOA2        |         | Method: SW8260 |       |                                  |               |       |           |      |
|-----------------------------|--------|-------------------------|---------|----------------|-------|----------------------------------|---------------|-------|-----------|------|
| LCS                         |        | Sample ID: VLCSW-181028 |         | Units: ug/L    |       | Analysis Date: 28-Oct-2018 12:19 |               |       |           |      |
| Client ID:                  |        | Run ID: VOA2_326371     |         | SeqNo: 4795122 |       | PrepDate:                        |               | DF: 1 |           |      |
| Analyte                     | Result | PQL                     | SPK Val | SPK Ref Value  | %REC  | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Bromomethane                | 22.19  | 1.0                     | 20      | 0              | 111   | 70 - 130                         |               |       |           |      |
| Carbon disulfide            | 37.79  | 2.0                     | 40      | 0              | 94.5  | 70 - 130                         |               |       |           |      |
| Carbon tetrachloride        | 20.25  | 1.0                     | 20      | 0              | 101   | 71 - 125                         |               |       |           |      |
| Chlorobenzene               | 20.5   | 1.0                     | 20      | 0              | 102   | 76 - 113                         |               |       |           |      |
| Chloroethane                | 20.06  | 1.0                     | 20      | 0              | 100   | 70 - 130                         |               |       |           |      |
| Chloroform                  | 19.26  | 1.0                     | 20      | 0              | 96.3  | 71 - 121                         |               |       |           |      |
| Chloromethane               | 19.64  | 1.0                     | 20      | 0              | 98.2  | 70 - 129                         |               |       |           |      |
| cis-1,2-Dichloroethene      | 20.07  | 1.0                     | 20      | 0              | 100   | 75 - 122                         |               |       |           |      |
| cis-1,3-Dichloropropene     | 22.66  | 1.0                     | 20      | 0              | 113   | 73 - 127                         |               |       |           |      |
| Dibromochloromethane        | 20.17  | 1.0                     | 20      | 0              | 101   | 77 - 122                         |               |       |           |      |
| Dibromomethane              | 21.29  | 1.0                     | 20      | 0              | 106   | 78 - 121                         |               |       |           |      |
| Dichlorodifluoromethane     | 21.55  | 1.0                     | 20      | 0              | 108   | 70 - 130                         |               |       |           |      |
| Ethylbenzene                | 22     | 1.0                     | 20      | 0              | 110   | 77 - 117                         |               |       |           |      |
| Hexachlorobutadiene         | 19.67  | 1.0                     | 20      | 0              | 98.3  | 70 - 130                         |               |       |           |      |
| Isopropylbenzene            | 19.53  | 1.0                     | 20      | 0              | 97.6  | 73 - 127                         |               |       |           |      |
| m,p-Xylene                  | 44.79  | 2.0                     | 40      | 0              | 112   | 77 - 122                         |               |       |           |      |
| Methylene chloride          | 20.25  | 2.0                     | 20      | 0              | 101   | 70 - 127                         |               |       |           |      |
| Naphthalene                 | 18.02  | 1.0                     | 20      | 0              | 90.1  | 70 - 130                         |               |       |           |      |
| n-Butylbenzene              | 20.37  | 1.0                     | 20      | 0              | 102   | 72 - 130                         |               |       |           |      |
| n-Propylbenzene             | 21     | 1.0                     | 20      | 0              | 105   | 73 - 124                         |               |       |           |      |
| o-Xylene                    | 22.01  | 1.0                     | 20      | 0              | 110   | 75 - 119                         |               |       |           |      |
| sec-Butylbenzene            | 18.44  | 1.0                     | 20      | 0              | 92.2  | 73 - 128                         |               |       |           |      |
| Styrene                     | 20.69  | 1.0                     | 20      | 0              | 103   | 72 - 126                         |               |       |           |      |
| tert-Butylbenzene           | 20.21  | 1.0                     | 20      | 0              | 101   | 73 - 124                         |               |       |           |      |
| Tetrachloroethene           | 20.07  | 1.0                     | 20      | 0              | 100   | 76 - 119                         |               |       |           |      |
| Toluene                     | 19.73  | 1.0                     | 20      | 0              | 98.6  | 77 - 118                         |               |       |           |      |
| trans-1,2-Dichloroethene    | 20.37  | 1.0                     | 20      | 0              | 102   | 72 - 127                         |               |       |           |      |
| trans-1,3-Dichloropropene   | 23.6   | 1.0                     | 20      | 0              | 118   | 77 - 119                         |               |       |           |      |
| Trichloroethene             | 19.99  | 1.0                     | 20      | 0              | 100.0 | 77 - 121                         |               |       |           |      |
| Trichlorofluoromethane      | 21.03  | 1.0                     | 20      | 0              | 105   | 70 - 130                         |               |       |           |      |
| Vinyl chloride              | 20.87  | 1.0                     | 20      | 0              | 104   | 70 - 130                         |               |       |           |      |
| Surr: 1,2-Dichloroethane-d4 | 49.12  | 1.0                     | 50      | 0              | 98.2  | 70 - 130                         |               |       |           |      |
| Surr: 4-Bromofluorobenzene  | 52.09  | 1.0                     | 50      | 0              | 104   | 82 - 115                         |               |       |           |      |
| Surr: Dibromofluoromethane  | 48.3   | 1.0                     | 50      | 0              | 96.6  | 73 - 126                         |               |       |           |      |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371 |                         | Instrument: VOA2 |                | Method: SW8260 |                                  |               |               |      |           |      |
|-------------------|-------------------------|------------------|----------------|----------------|----------------------------------|---------------|---------------|------|-----------|------|
| LCS               | Sample ID: VLCSW-181028 | Units: ug/L      |                |                | Analysis Date: 28-Oct-2018 12:19 |               |               |      |           |      |
| Client ID:        | Run ID: VOA2_326371     |                  | SeqNo: 4795122 |                | PrepDate:                        |               | DF: 1         |      |           |      |
| Analyte           | Result                  | PQL              | SPK Val        | SPK Ref Value  | %REC                             | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Surr: Toluene-d8  | 45.03                   | 1.0              | 50             | 0              | 90.1                             | 81 - 120      |               |      |           |      |

## ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

## QC BATCH REPORT

| Batch ID: R326371                    |        | Instrument: VOA2                  |         | Method: SW8260        |      |   |               |              |                |
|--------------------------------------|--------|-----------------------------------|---------|-----------------------|------|---|---------------|--------------|----------------|
| <b>MS</b>                            |        | Sample ID: <b>HS18101278-01MS</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>28-Oct-2018 13:57</b> |               |              |                |
| Client ID: <b>67WW14-181022</b>      |        | Run ID: <b>VOA2_326371</b>        |         | SeqNo: <b>4795126</b> |      | PrepDate:                               |               | DF: <b>1</b> |                |
| Analyte                              | Result | PQL                               | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 18.55  | 1.0                               | 20      | 0                     | 92.7 | 70 - 120                                |               |              |                |
| 1,1,1-Trichloroethane                | 18.37  | 1.0                               | 20      | 0                     | 91.9 | 70 - 130                                |               |              |                |
| 1,1,2,2-Tetrachloroethane            | 15.9   | 1.0                               | 20      | 0                     | 79.5 | 70 - 123                                |               |              |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 20.31  | 1.0                               | 20      | 0                     | 102  | 70 - 130                                |               |              |                |
| 1,1,2-Trichloroethane                | 18.29  | 1.0                               | 20      | 0                     | 91.5 | 70 - 117                                |               |              |                |
| 1,1-Dichloroethane                   | 20.26  | 1.0                               | 20      | 1.269                 | 94.9 | 70 - 127                                |               |              |                |
| 1,1-Dichloroethene                   | 25.72  | 1.0                               | 20      | 6.577                 | 95.7 | 70 - 130                                |               |              |                |
| 1,1-Dichloropropene                  | 21.15  | 1.0                               | 20      | 0                     | 106  | 70 - 129                                |               |              |                |
| 1,2,3-Trichlorobenzene               | 15.4   | 1.0                               | 20      | 0                     | 77.0 | 70 - 130                                |               |              |                |
| 1,2,3-Trichloropropane               | 16     | 1.0                               | 20      | 0                     | 80.0 | 70 - 130                                |               |              |                |
| 1,2,4-Trichlorobenzene               | 16.44  | 1.0                               | 20      | 0                     | 82.2 | 70 - 125                                |               |              |                |
| 1,2,4-Trimethylbenzene               | 18.54  | 1.0                               | 20      | 0                     | 92.7 | 70 - 125                                |               |              |                |
| 1,2-Dibromo-3-chloropropane          | 15.26  | 1.0                               | 20      | 0                     | 76.3 | 70 - 130                                |               |              |                |
| 1,2-Dibromoethane                    | 18.38  | 1.0                               | 20      | 0                     | 91.9 | 70 - 124                                |               |              |                |
| 1,2-Dichlorobenzene                  | 17.35  | 1.0                               | 20      | 0                     | 86.7 | 70 - 115                                |               |              |                |
| 1,2-Dichloroethane                   | 22.04  | 1.0                               | 20      | 2.545                 | 97.5 | 70 - 127                                |               |              |                |
| 1,2-Dichloropropane                  | 19.62  | 1.0                               | 20      | 0                     | 98.1 | 70 - 122                                |               |              |                |
| 1,3,5-Trimethylbenzene               | 17.16  | 1.0                               | 20      | 0                     | 85.8 | 70 - 126                                |               |              |                |
| 1,3-Dichlorobenzene                  | 17.75  | 1.0                               | 20      | 0                     | 88.7 | 70 - 119                                |               |              |                |
| 1,3-Dichloropropane                  | 18.26  | 1.0                               | 20      | 0                     | 91.3 | 70 - 121                                |               |              |                |
| 1,4-Dichlorobenzene                  | 17.48  | 1.0                               | 20      | 0                     | 87.4 | 70 - 114                                |               |              |                |
| 2,2-Dichloropropane                  | 21.28  | 1.0                               | 20      | 0                     | 106  | 70 - 130                                |               |              |                |
| 2-Butanone                           | 34.4   | 2.0                               | 40      | 0                     | 86.0 | 70 - 130                                |               |              |                |
| 2-Chlorotoluene                      | 19.37  | 1.0                               | 20      | 0                     | 96.8 | 70 - 130                                |               |              |                |
| 2-Hexanone                           | 34.34  | 2.0                               | 40      | 0                     | 85.8 | 70 - 130                                |               |              |                |
| 4-Chlorotoluene                      | 19.44  | 1.0                               | 20      | 0                     | 97.2 | 70 - 130                                |               |              |                |
| 4-Isopropyltoluene                   | 16.73  | 1.0                               | 20      | 0                     | 83.7 | 70 - 130                                |               |              |                |
| 4-Methyl-2-pentanone                 | 35.01  | 2.0                               | 40      | 0                     | 87.5 | 70 - 130                                |               |              |                |
| Acetone                              | 31.8   | 2.0                               | 40      | 0                     | 79.5 | 70 - 130                                |               |              |                |
| Benzene                              | 18.66  | 1.0                               | 20      | 0                     | 93.3 | 70 - 127                                |               |              |                |
| Bromobenzene                         | 17.41  | 1.0                               | 20      | 0                     | 87.1 | 70 - 115                                |               |              |                |
| Bromochloromethane                   | 18.83  | 1.0                               | 20      | 0                     | 94.1 | 70 - 127                                |               |              |                |
| Bromodichloromethane                 | 19.09  | 1.0                               | 20      | 0                     | 95.5 | 70 - 124                                |               |              |                |
| Bromoform                            | 16.88  | 1.0                               | 20      | 0                     | 84.4 | 70 - 129                                |               |              |                |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371           |        | Instrument: VOA2           |         | Method: SW8260 |      |                                  |               |       |                |
|-----------------------------|--------|----------------------------|---------|----------------|------|----------------------------------|---------------|-------|----------------|
| MS                          |        | Sample ID: HS18101278-01MS |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 13:57 |               |       |                |
| Client ID: 67WW14-181022    |        | Run ID: VOA2_326371        |         | SeqNo: 4795126 |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                        | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 19.49  | 1.0                        | 20      | 0              | 97.4 | 70 - 130                         |               |       |                |
| Carbon disulfide            | 35.99  | 2.0                        | 40      | 0              | 90.0 | 70 - 130                         |               |       |                |
| Carbon tetrachloride        | 19.53  | 1.0                        | 20      | 0              | 97.7 | 70 - 130                         |               |       |                |
| Chlorobenzene               | 18.58  | 1.0                        | 20      | 0              | 92.9 | 70 - 114                         |               |       |                |
| Chloroethane                | 18.43  | 1.0                        | 20      | 0              | 92.1 | 70 - 130                         |               |       |                |
| Chloroform                  | 18.41  | 1.0                        | 20      | 0              | 92.0 | 70 - 125                         |               |       |                |
| Chloromethane               | 14.47  | 1.0                        | 20      | 0              | 72.4 | 70 - 130                         |               |       |                |
| cis-1,2-Dichloroethene      | 18.88  | 1.0                        | 20      | 0              | 94.4 | 70 - 128                         |               |       |                |
| cis-1,3-Dichloropropene     | 20.19  | 1.0                        | 20      | 0              | 101  | 70 - 125                         |               |       |                |
| Dibromochloromethane        | 17.77  | 1.0                        | 20      | 0              | 88.9 | 70 - 124                         |               |       |                |
| Dibromomethane              | 18.73  | 1.0                        | 20      | 0              | 93.7 | 70 - 124                         |               |       |                |
| Dichlorodifluoromethane     | 10.34  | 1.0                        | 20      | 0              | 51.7 | 70 - 130                         |               |       | S              |
| Ethylbenzene                | 19.97  | 1.0                        | 20      | 0              | 99.9 | 70 - 124                         |               |       |                |
| Hexachlorobutadiene         | 18.31  | 1.0                        | 20      | 0              | 91.5 | 70 - 130                         |               |       |                |
| Isopropylbenzene            | 18.48  | 1.0                        | 20      | 0              | 92.4 | 70 - 130                         |               |       |                |
| m,p-Xylene                  | 40.12  | 2.0                        | 40      | 0              | 100  | 70 - 130                         |               |       |                |
| Methylene chloride          | 18.66  | 2.0                        | 20      | 0              | 93.3 | 70 - 128                         |               |       |                |
| Naphthalene                 | 13.59  | 1.0                        | 20      | 0              | 67.9 | 70 - 130                         |               |       | S              |
| n-Butylbenzene              | 18.86  | 1.0                        | 20      | 0              | 94.3 | 70 - 130                         |               |       |                |
| n-Propylbenzene             | 19.5   | 1.0                        | 20      | 0              | 97.5 | 70 - 130                         |               |       |                |
| o-Xylene                    | 19.53  | 1.0                        | 20      | 0              | 97.7 | 70 - 124                         |               |       |                |
| sec-Butylbenzene            | 17.4   | 1.0                        | 20      | 0              | 87.0 | 70 - 130                         |               |       |                |
| Styrene                     | 17.31  | 1.0                        | 20      | 0              | 86.5 | 70 - 130                         |               |       |                |
| tert-Butylbenzene           | 19.09  | 1.0                        | 20      | 0              | 95.5 | 70 - 130                         |               |       |                |
| Tetrachloroethene           | 18.83  | 1.0                        | 20      | 0              | 94.2 | 70 - 130                         |               |       |                |
| Toluene                     | 18.42  | 1.0                        | 20      | 0              | 92.1 | 70 - 123                         |               |       |                |
| trans-1,2-Dichloroethene    | 19     | 1.0                        | 20      | 0              | 95.0 | 70 - 130                         |               |       |                |
| trans-1,3-Dichloropropene   | 19.92  | 1.0                        | 20      | 0              | 99.6 | 70 - 121                         |               |       |                |
| Trichloroethene             | 18.73  | 1.0                        | 20      | 0              | 93.7 | 70 - 129                         |               |       |                |
| Trichlorofluoromethane      | 18.77  | 1.0                        | 20      | 0              | 93.9 | 70 - 130                         |               |       |                |
| Vinyl chloride              | 17.23  | 1.0                        | 20      | 0              | 86.2 | 70 - 130                         |               |       |                |
| Surr: 1,2-Dichloroethane-d4 | 49.41  | 1.0                        | 50      | 0              | 98.8 | 70 - 126                         |               |       |                |
| Surr: 4-Bromofluorobenzene  | 51.13  | 1.0                        | 50      | 0              | 102  | 81 - 113                         |               |       |                |
| Surr: Dibromofluoromethane  | 49.09  | 1.0                        | 50      | 0              | 98.2 | 77 - 123                         |               |       |                |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371 |                            | Instrument: VOA2 |                     | Method: SW8260 |                                  |      |               |               |       |                |
|-------------------|----------------------------|------------------|---------------------|----------------|----------------------------------|------|---------------|---------------|-------|----------------|
| MS                | Sample ID: HS18101278-01MS |                  | Units: ug/L         |                | Analysis Date: 28-Oct-2018 13:57 |      |               |               |       |                |
|                   | Client ID: 67WW14-181022   |                  | Run ID: VOA2_326371 |                | SeqNo: 4795126                   |      | PrepDate:     |               | DF: 1 |                |
|                   | Analyte                    | Result           | PQL                 | SPK Val        | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD  | RPD Limit Qual |
| Surr: Toluene-d8  |                            | 45.32            | 1.0                 | 50             | 0                                | 90.6 | 82 - 127      |               |       |                |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371                    |        | Instrument: VOA2            |         | Method: SW8260 |      |                                  |               |        |                |
|--------------------------------------|--------|-----------------------------|---------|----------------|------|----------------------------------|---------------|--------|----------------|
| MSD                                  |        | Sample ID: HS18101278-01MSD |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 14:22 |               |        |                |
| Client ID: 67WW14-181022             |        | Run ID: VOA2_326371         |         | SeqNo: 4795127 |      | PrepDate:                        |               | DF: 1  |                |
| Analyte                              | Result | PQL                         | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD   | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 18.04  | 1.0                         | 20      | 0              | 90.2 | 70 - 120                         | 18.55         | 2.78   | 20             |
| 1,1,1-Trichloroethane                | 17.6   | 1.0                         | 20      | 0              | 88.0 | 70 - 130                         | 18.37         | 4.29   | 20             |
| 1,1,2,2-Tetrachloroethane            | 16.37  | 1.0                         | 20      | 0              | 81.9 | 70 - 123                         | 15.9          | 2.94   | 20             |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 18.84  | 1.0                         | 20      | 0              | 94.2 | 70 - 130                         | 20.31         | 7.54   | 20             |
| 1,1,2-Trichloroethane                | 18.08  | 1.0                         | 20      | 0              | 90.4 | 70 - 117                         | 18.29         | 1.18   | 20             |
| 1,1-Dichloroethane                   | 19.53  | 1.0                         | 20      | 1.269          | 91.3 | 70 - 127                         | 20.26         | 3.63   | 20             |
| 1,1-Dichloroethene                   | 23.83  | 1.0                         | 20      | 6.577          | 86.2 | 70 - 130                         | 25.72         | 7.64   | 20             |
| 1,1-Dichloropropene                  | 19.1   | 1.0                         | 20      | 0              | 95.5 | 70 - 129                         | 21.15         | 10.2   | 20             |
| 1,2,3-Trichlorobenzene               | 16.28  | 1.0                         | 20      | 0              | 81.4 | 70 - 130                         | 15.4          | 5.5    | 20             |
| 1,2,3-Trichloropropane               | 16.81  | 1.0                         | 20      | 0              | 84.0 | 70 - 130                         | 16            | 4.95   | 20             |
| 1,2,4-Trichlorobenzene               | 17.4   | 1.0                         | 20      | 0              | 87.0 | 70 - 125                         | 16.44         | 5.68   | 20             |
| 1,2,4-Trimethylbenzene               | 18.1   | 1.0                         | 20      | 0              | 90.5 | 70 - 125                         | 18.54         | 2.41   | 20             |
| 1,2-Dibromo-3-chloropropane          | 15.79  | 1.0                         | 20      | 0              | 79.0 | 70 - 130                         | 15.26         | 3.43   | 20             |
| 1,2-Dibromoethane                    | 18.67  | 1.0                         | 20      | 0              | 93.3 | 70 - 124                         | 18.38         | 1.55   | 20             |
| 1,2-Dichlorobenzene                  | 17.32  | 1.0                         | 20      | 0              | 86.6 | 70 - 115                         | 17.35         | 0.157  | 20             |
| 1,2-Dichloroethane                   | 21.48  | 1.0                         | 20      | 2.545          | 94.7 | 70 - 127                         | 22.04         | 2.59   | 20             |
| 1,2-Dichloropropane                  | 19.75  | 1.0                         | 20      | 0              | 98.7 | 70 - 122                         | 19.62         | 0.614  | 20             |
| 1,3,5-Trimethylbenzene               | 17.01  | 1.0                         | 20      | 0              | 85.1 | 70 - 126                         | 17.16         | 0.847  | 20             |
| 1,3-Dichlorobenzene                  | 17.83  | 1.0                         | 20      | 0              | 89.2 | 70 - 119                         | 17.75         | 0.472  | 20             |
| 1,3-Dichloropropane                  | 18.33  | 1.0                         | 20      | 0              | 91.7 | 70 - 121                         | 18.26         | 0.397  | 20             |
| 1,4-Dichlorobenzene                  | 17.72  | 1.0                         | 20      | 0              | 88.6 | 70 - 114                         | 17.48         | 1.36   | 20             |
| 2,2-Dichloropropane                  | 20.43  | 1.0                         | 20      | 0              | 102  | 70 - 130                         | 21.28         | 4.06   | 20             |
| 2-Butanone                           | 36.87  | 2.0                         | 40      | 0              | 92.2 | 70 - 130                         | 34.4          | 6.96   | 20             |
| 2-Chlorotoluene                      | 18.91  | 1.0                         | 20      | 0              | 94.5 | 70 - 130                         | 19.37         | 2.4    | 20             |
| 2-Hexanone                           | 34.67  | 2.0                         | 40      | 0              | 86.7 | 70 - 130                         | 34.34         | 0.96   | 20             |
| 4-Chlorotoluene                      | 19.25  | 1.0                         | 20      | 0              | 96.3 | 70 - 130                         | 19.44         | 0.982  | 20             |
| 4-Isopropyltoluene                   | 16.31  | 1.0                         | 20      | 0              | 81.6 | 70 - 130                         | 16.73         | 2.56   | 20             |
| 4-Methyl-2-pentanone                 | 36.78  | 2.0                         | 40      | 0              | 91.9 | 70 - 130                         | 35.01         | 4.92   | 20             |
| Acetone                              | 35.63  | 2.0                         | 40      | 0              | 89.1 | 70 - 130                         | 31.8          | 11.4   | 20             |
| Benzene                              | 18.44  | 1.0                         | 20      | 0              | 92.2 | 70 - 127                         | 18.66         | 1.21   | 20             |
| Bromobenzene                         | 17.43  | 1.0                         | 20      | 0              | 87.1 | 70 - 115                         | 17.41         | 0.0855 | 20             |
| Bromochloromethane                   | 18.45  | 1.0                         | 20      | 0              | 92.2 | 70 - 127                         | 18.83         | 2.03   | 20             |
| Bromodichloromethane                 | 18.84  | 1.0                         | 20      | 0              | 94.2 | 70 - 124                         | 19.09         | 1.32   | 20             |
| Bromoform                            | 17.22  | 1.0                         | 20      | 0              | 86.1 | 70 - 129                         | 16.88         | 1.94   | 20             |



## ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

## QC BATCH REPORT

| Batch ID: R326371           |        | Instrument: VOA2            |         | Method: SW8260 |      |                                  |               |       |                |
|-----------------------------|--------|-----------------------------|---------|----------------|------|----------------------------------|---------------|-------|----------------|
| <b>MSD</b>                  |        | Sample ID: HS18101278-01MSD |         | Units: ug/L    |      | Analysis Date: 28-Oct-2018 14:22 |               |       |                |
| Client ID: 67WW14-181022    |        | Run ID: VOA2_326371         |         | SeqNo: 4795127 |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                         | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 19.12  | 1.0                         | 20      | 0              | 95.6 | 70 - 130                         | 19.49         | 1.88  | 20             |
| Carbon disulfide            | 33.92  | 2.0                         | 40      | 0              | 84.8 | 70 - 130                         | 35.99         | 5.92  | 20             |
| Carbon tetrachloride        | 18.76  | 1.0                         | 20      | 0              | 93.8 | 70 - 130                         | 19.53         | 4.05  | 20             |
| Chlorobenzene               | 18.41  | 1.0                         | 20      | 0              | 92.0 | 70 - 114                         | 18.58         | 0.931 | 20             |
| Chloroethane                | 17.41  | 1.0                         | 20      | 0              | 87.1 | 70 - 130                         | 18.43         | 5.66  | 20             |
| Chloroform                  | 17.82  | 1.0                         | 20      | 0              | 89.1 | 70 - 125                         | 18.41         | 3.26  | 20             |
| Chloromethane               | 13.99  | 1.0                         | 20      | 0              | 70.0 | 70 - 130                         | 14.47         | 3.35  | 20 S           |
| cis-1,2-Dichloroethene      | 18.77  | 1.0                         | 20      | 0              | 93.9 | 70 - 128                         | 18.88         | 0.564 | 20             |
| cis-1,3-Dichloropropene     | 20.12  | 1.0                         | 20      | 0              | 101  | 70 - 125                         | 20.19         | 0.377 | 20             |
| Dibromochloromethane        | 18.02  | 1.0                         | 20      | 0              | 90.1 | 70 - 124                         | 17.77         | 1.37  | 20             |
| Dibromomethane              | 19.04  | 1.0                         | 20      | 0              | 95.2 | 70 - 124                         | 18.73         | 1.63  | 20             |
| Dichlorodifluoromethane     | 8.888  | 1.0                         | 20      | 0              | 44.4 | 70 - 130                         | 10.34         | 15.1  | 20 S           |
| Ethylbenzene                | 19.4   | 1.0                         | 20      | 0              | 97.0 | 70 - 124                         | 19.97         | 2.92  | 20             |
| Hexachlorobutadiene         | 17.43  | 1.0                         | 20      | 0              | 87.1 | 70 - 130                         | 18.31         | 4.93  | 20             |
| Isopropylbenzene            | 17.68  | 1.0                         | 20      | 0              | 88.4 | 70 - 130                         | 18.48         | 4.4   | 20             |
| m,p-Xylene                  | 39.16  | 2.0                         | 40      | 0              | 97.9 | 70 - 130                         | 40.12         | 2.42  | 20             |
| Methylene chloride          | 18.06  | 2.0                         | 20      | 0              | 90.3 | 70 - 128                         | 18.66         | 3.25  | 20             |
| Naphthalene                 | 15.32  | 1.0                         | 20      | 0              | 76.6 | 70 - 130                         | 13.59         | 12    | 20             |
| n-Butylbenzene              | 18.38  | 1.0                         | 20      | 0              | 91.9 | 70 - 130                         | 18.86         | 2.59  | 20             |
| n-Propylbenzene             | 18.99  | 1.0                         | 20      | 0              | 95.0 | 70 - 130                         | 19.5          | 2.62  | 20             |
| o-Xylene                    | 19.1   | 1.0                         | 20      | 0              | 95.5 | 70 - 124                         | 19.53         | 2.22  | 20             |
| sec-Butylbenzene            | 16.86  | 1.0                         | 20      | 0              | 84.3 | 70 - 130                         | 17.4          | 3.16  | 20             |
| Styrene                     | 17.53  | 1.0                         | 20      | 0              | 87.6 | 70 - 130                         | 17.31         | 1.26  | 20             |
| tert-Butylbenzene           | 18.42  | 1.0                         | 20      | 0              | 92.1 | 70 - 130                         | 19.09         | 3.57  | 20             |
| Tetrachloroethene           | 17.73  | 1.0                         | 20      | 0              | 88.7 | 70 - 130                         | 18.83         | 6.01  | 20             |
| Toluene                     | 17.86  | 1.0                         | 20      | 0              | 89.3 | 70 - 123                         | 18.42         | 3.07  | 20             |
| trans-1,2-Dichloroethene    | 18.52  | 1.0                         | 20      | 0              | 92.6 | 70 - 130                         | 19            | 2.57  | 20             |
| trans-1,3-Dichloropropene   | 20.68  | 1.0                         | 20      | 0              | 103  | 70 - 121                         | 19.92         | 3.74  | 20             |
| Trichloroethene             | 18.11  | 1.0                         | 20      | 0              | 90.5 | 70 - 129                         | 18.73         | 3.39  | 20             |
| Trichlorofluoromethane      | 17.05  | 1.0                         | 20      | 0              | 85.2 | 70 - 130                         | 18.77         | 9.64  | 20             |
| Vinyl chloride              | 16.27  | 1.0                         | 20      | 0              | 81.3 | 70 - 130                         | 17.23         | 5.76  | 20             |
| Surr: 1,2-Dichloroethane-d4 | 49.58  | 1.0                         | 50      | 0              | 99.2 | 70 - 126                         | 49.41         | 0.338 | 20             |
| Surr: 4-Bromofluorobenzene  | 51.35  | 1.0                         | 50      | 0              | 103  | 81 - 113                         | 51.13         | 0.416 | 20             |
| Surr: Dibromofluoromethane  | 48.97  | 1.0                         | 50      | 0              | 97.9 | 77 - 123                         | 49.09         | 0.249 | 20             |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326371               |        | Instrument: VOA2                   |            | Method: SW8260        |                 |
|---------------------------------|--------|------------------------------------|------------|-----------------------|-----------------|
| <b>MSD</b>                      |        | Sample ID: <b>HS18101278-01MSD</b> |            | Units: <b>ug/L</b>    |                 |
| Client ID: <b>67WW14-181022</b> |        | Run ID: <b>VOA2_326371</b>         |            | SeqNo: <b>4795127</b> |                 |
|                                 |        |                                    |            | PrepDate:             |                 |
|                                 |        |                                    |            | DF: 1                 |                 |
| Analyte                         | Result | PQL                                | SPK Val    | SPK Ref Value         | %REC            |
|                                 |        |                                    |            | Control Limit         | RPD Ref Value   |
|                                 |        |                                    |            |                       | %RPD            |
|                                 |        |                                    |            |                       | RPD Limit Qual  |
| <i>Surr: Toluene-d8</i>         |        | <i>44.94</i>                       | <i>1.0</i> | <i>50</i>             | <i>0</i>        |
|                                 |        |                                    |            | <i>89.9</i>           | <i>82 - 127</i> |
|                                 |        |                                    |            | <i>45.32</i>          | <i>0.831</i>    |
|                                 |        |                                    |            |                       | <i>20</i>       |

The following samples were analyzed in this batch:

|               |               |               |               |
|---------------|---------------|---------------|---------------|
| HS18101278-01 | HS18101278-02 | HS18101278-03 | HS18101278-04 |
| HS18101278-05 | HS18101278-06 | HS18101278-07 | HS18101278-08 |
| HS18101278-09 |               |               |               |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326268                                  |                             | Instrument: UV-2450 |                | Method: SM3500FED                |           |               |               |       |           |      |
|--|-----------------------------|---------------------|----------------|----------------------------------|-----------|---------------|---------------|-------|-----------|------|
| <b>MBLK</b>  | Sample ID: MBLK-326268      | Units: mg/L         |                | Analysis Date: 24-Oct-2018 10:44 |           |               |               |       |           |      |
| Client ID:   | Run ID: UV-2450_326268      |                     | SeqNo: 4792611 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                      | PQL                 | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Ferrous Iron                                       | 0.0500                      | 0.0500              |                |                                  |           | 80 - 120      |               |       |           | U    |
| <b>LCS</b>   | Sample ID: LCS-326268       | Units: mg/L         |                | Analysis Date: 24-Oct-2018 10:44 |           |               |               |       |           |      |
| Client ID:   | Run ID: UV-2450_326268      |                     | SeqNo: 4792612 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                      | PQL                 | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Ferrous Iron                                       | 0.268                       | 0.0500              | 0.25           | 0                                | 107       | 80 - 120      |               |       |           |      |
| <b>MS</b>  | Sample ID: HS18101278-04MS  | Units: mg/L         |                | Analysis Date: 24-Oct-2018 10:44 |           |               |               |       |           |      |
| Client ID: 67WW13-181023                           | Run ID: UV-2450_326268      |                     | SeqNo: 4792614 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                      | PQL                 | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Ferrous Iron                                       | 0.232                       | 0.0500              | 0.25           | 0.035                            | 78.8      | 75 - 125      |               |       |           |      |
| <b>MSD</b>   | Sample ID: HS18101278-04MSD | Units: mg/L         |                | Analysis Date: 24-Oct-2018 10:44 |           |               |               |       |           |      |
| Client ID: 67WW13-181023                           | Run ID: UV-2450_326268      |                     | SeqNo: 4792615 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                      | PQL                 | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Ferrous Iron                                       | 0.231                       | 0.0500              | 0.25           | 0.035                            | 78.4      | 75 - 125      | 0.232         | 0.432 | 20        |      |
| The following samples were analyzed in this batch: |                             |                     |                |                                  |           |               |               |       |           |      |
| HS18101278-04                                      |                             |                     | HS18101278-05  |                                  |           | HS18101278-06 |               |       |           |      |

ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326270                                  |                            | Instrument: WetChem_HS |                | Method: E376.1                   |           |               |               |       |           |      |
|--|----------------------------|------------------------|----------------|----------------------------------|-----------|---------------|---------------|-------|-----------|------|
| <b>MBLK</b>  | Sample ID: MBLK-R326270    | Units: mg/L            |                | Analysis Date: 27-Oct-2018 14:00 |           |               |               |       |           |      |
| Client ID:   | Run ID: WetChem_HS_326270  |                        | SeqNo: 4792667 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                     | PQL                    | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Sulfide  | 1.00                       | 1.00                   |                |                                  |           |               |               |       |           | U    |
| <b>LCS</b>   | Sample ID: LCS-R326270     | Units: mg/L            |                | Analysis Date: 27-Oct-2018 14:00 |           |               |               |       |           |      |
| Client ID:   | Run ID: WetChem_HS_326270  |                        | SeqNo: 4792666 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                     | PQL                    | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Sulfide  | 21.48                      | 1.00                   | 25             | 0                                | 85.9      | 80 - 120      |               |       |           |      |
| <b>LCSD</b>  | Sample ID: LCSD-R326270    | Units: mg/L            |                | Analysis Date: 27-Oct-2018 14:00 |           |               |               |       |           |      |
| Client ID:   | Run ID: WetChem_HS_326270  |                        | SeqNo: 4792665 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                     | PQL                    | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Sulfide  | 21.68                      | 1.00                   | 25             | 0                                | 86.7      | 80 - 120      | 21.48         | 0.927 | 20        |      |
| <b>MS</b>  | Sample ID: HS18101278-05MS | Units: mg/L            |                | Analysis Date: 27-Oct-2018 14:00 |           |               |               |       |           |      |
| Client ID: 67WW08-181023                           | Run ID: WetChem_HS_326270  |                        | SeqNo: 4792668 |                                  | PrepDate: |               | DF: 1         |       |           |      |
| Analyte  | Result                     | PQL                    | SPK Val        | SPK Ref Value                    | %REC      | Control Limit | RPD Ref Value | %RPD  | RPD Limit | Qual |
| Sulfide  | 29.68                      | 1.00                   | 25             | -0.12                            | 119       | 80 - 120      |               |       |           |      |
| The following samples were analyzed in this batch: |                            |                        |                |                                  |           |               |               |       |           |      |
|  |                            | HS18101278-04          |                | HS18101278-05                    |           | HS18101278-06 |               |       |           |      |

## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326282                                  |                             | Instrument: ManTech01 |               | Method: SM2320B                  |      |               |               |         |           |      |
|--|-----------------------------|-----------------------|---------------|----------------------------------|------|---------------|---------------|---------|-----------|------|
| <b>MBLK</b>  | Sample ID: WBLKW1-181027    | Units: mg/L           |               | Analysis Date: 27-Oct-2018 16:14 |      |               |               |         |           |      |
| Client ID:   | Run ID: ManTech01_326282    | SeqNo: 4792844        |               | PrepDate:                        |      | DF: 1         |               |         |           |      |
| Analyte  | Result                      | PQL                   | SPK Val       | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD    | RPD Limit | Qual |
| Alkalinity, Total (As CaCO3)                       | 5.00                        | 5.00                  |               |                                  |      |               |               |         |           | U    |
| <b>LCS</b>   | Sample ID: WLCS1-181027     | Units: mg/L           |               | Analysis Date: 27-Oct-2018 16:23 |      |               |               |         |           |      |
| Client ID:   | Run ID: ManTech01_326282    | SeqNo: 4792845        |               | PrepDate:                        |      | DF: 1         |               |         |           |      |
| Analyte  | Result                      | PQL                   | SPK Val       | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD    | RPD Limit | Qual |
| Alkalinity, Total (As CaCO3)                       | 1077                        | 5.00                  | 1000          | 0                                | 108  | 85 - 115      |               |         |           |      |
| <b>LCSD</b>  | Sample ID: WLCSD1-181027    | Units: mg/L           |               | Analysis Date: 27-Oct-2018 16:32 |      |               |               |         |           |      |
| Client ID:   | Run ID: ManTech01_326282    | SeqNo: 4792846        |               | PrepDate:                        |      | DF: 1         |               |         |           |      |
| Analyte  | Result                      | PQL                   | SPK Val       | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD    | RPD Limit | Qual |
| Alkalinity, Total (As CaCO3)                       | 1062                        | 5.00                  | 1000          | 0                                | 106  | 85 - 115      | 1077          | 1.42    | 20        |      |
| <b>DUP</b>   | Sample ID: HS18101324-02DUP | Units: mg/L           |               | Analysis Date: 27-Oct-2018 17:03 |      |               |               |         |           |      |
| Client ID:   | Run ID: ManTech01_326282    | SeqNo: 4792851        |               | PrepDate:                        |      | DF: 1         |               |         |           |      |
| Analyte  | Result                      | PQL                   | SPK Val       | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD    | RPD Limit | Qual |
| Alkalinity, Total (As CaCO3)                       | 304.8                       | 5.00                  |               |                                  |      |               | 304.8         | 0.00328 | 20        |      |
| The following samples were analyzed in this batch: |                             |                       |               |                                  |      |               |               |         |           |      |
| HS18101278-04                                      |                             |                       | HS18101278-05 |                                  |      | HS18101278-06 |               |         |           |      |

## ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

## QC BATCH REPORT

| Batch ID: R326431        |                          | Instrument: ICS2100 |         | Method: SW9056                   |      |               |               |      |                |
|--------------------------|--------------------------|---------------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| <b>MBLK</b>              | Sample ID: WBLKW3-102318 | Units: mg/L         |         | Analysis Date: 24-Oct-2018 18:09 |      |               |               |      |                |
| Client ID:               | Run ID: ICS2100_326431   | SeqNo: 4796255      |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                   | PQL                 | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 0.500                    | 0.500               |         |                                  |      |               |               |      | U              |
| Nitrogen, Nitrate (As N) | 0.100                    | 0.100               |         |                                  |      |               |               |      | U              |
| Nitrogen, Nitrite (As N) | 0.100                    | 0.100               |         |                                  |      |               |               |      | U              |
| Sulfate                  | 0.500                    | 0.500               |         |                                  |      |               |               |      | U              |

| <b>LCS</b>               | Sample ID: WLCSW3-102318 | Units: mg/L    |         | Analysis Date: 24-Oct-2018 18:23 |      |               |               |      |                |
|--------------------------|--------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_326431   | SeqNo: 4796256 |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                   | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 19.45                    | 0.500          | 20      | 0                                | 97.3 | 80 - 120      |               |      |                |
| Nitrogen, Nitrate (As N) | 3.875                    | 0.100          | 4       | 0                                | 96.9 | 80 - 120      |               |      |                |
| Nitrogen, Nitrite (As N) | 4.066                    | 0.100          | 4       | 0                                | 102  | 80 - 120      |               |      |                |
| Sulfate                  | 19.27                    | 0.500          | 20      | 0                                | 96.4 | 80 - 120      |               |      |                |

| <b>LCSD</b>              | Sample ID: WLCSDW3-102318 | Units: mg/L    |         | Analysis Date: 24-Oct-2018 18:38 |      |               |               |      |                |
|--------------------------|---------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_326431    | SeqNo: 4796257 |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                    | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 19.85                     | 0.500          | 20      | 0                                | 99.3 | 80 - 120      | 19.45         | 2.04 | 20             |
| Nitrogen, Nitrate (As N) | 3.933                     | 0.100          | 4       | 0                                | 98.3 | 80 - 120      | 3.875         | 1.49 | 20             |
| Nitrogen, Nitrite (As N) | 4.15                      | 0.100          | 4       | 0                                | 104  | 80 - 120      | 4.066         | 2.04 | 20             |
| Sulfate                  | 19.79                     | 0.500          | 20      | 0                                | 99.0 | 80 - 120      | 19.27         | 2.66 | 20             |

| <b>MS</b>                | Sample ID: HS18101236-18MS | Units: mg/L    |         | Analysis Date: 24-Oct-2018 17:11 |      |               |               |      |                |
|--------------------------|----------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_326431     | SeqNo: 4796251 |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                     | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 21.88                      | 0.500          | 10      | 11.83                            | 100  | 80 - 120      |               |      |                |
| Nitrogen, Nitrate (As N) | 3.495                      | 0.100          | 2       | 1.417                            | 104  | 80 - 120      |               |      |                |
| Nitrogen, Nitrite (As N) | 2.106                      | 0.100          | 2       | 0                                | 105  | 80 - 120      |               |      |                |
| Sulfate                  | 71.91                      | 0.500          | 10      | 63.26                            | 86.5 | 80 - 120      |               |      | O              |



## ALS Houston, US

Date: 03-Dec-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: LHAAP-67

WorkOrder: HS18101278

## QC BATCH REPORT

| Batch ID: R326431 |                            | Instrument: ICS2100 |         | Method: SW9056                   |   |
|-------------------|----------------------------|---------------------|---------|----------------------------------|---|
| <b>MS</b>         | Sample ID: HS18101179-04MS | Units: mg/L         |         | Analysis Date: 25-Oct-2018 01:54 |   |
| Client ID:        | Run ID: ICS2100_326431     | SeqNo: 4796281      |         | PrepDate:                        | DF: 10  |
| Analyte           | Result                     | PQL                 | SPK Val | SPK Ref Value %REC               | Control Limit RPD Ref Value %RPD RPD Limit Qual |

|                          |       |      |     |       |      |          |
|--------------------------|-------|------|-----|-------|------|----------|
| Chloride                 | 141.9 | 5.00 | 100 | 40.55 | 101  | 80 - 120 |
| Nitrogen, Nitrate (As N) | 20.5  | 1.00 | 20  | 0     | 103  | 80 - 120 |
| Nitrogen, Nitrite (As N) | 21.14 | 1.00 | 20  | 0     | 106  | 80 - 120 |
| Sulfate                  | 290.7 | 5.00 | 100 | 191   | 99.7 | 80 - 120 |

|            |                             |                |         |                                  |   |
|------------|-----------------------------|----------------|---------|----------------------------------|---|
| <b>MSD</b> | Sample ID: HS18101236-18MSD | Units: mg/L    |         | Analysis Date: 24-Oct-2018 17:25 |   |
| Client ID: | Run ID: ICS2100_326431      | SeqNo: 4796252 |         | PrepDate:                        | DF: 1   |
| Analyte    | Result                      | PQL            | SPK Val | SPK Ref Value %REC               | Control Limit RPD Ref Value %RPD RPD Limit Qual |

|                          |       |       |    |       |      |          |       |       |       |
|--------------------------|-------|-------|----|-------|------|----------|-------|-------|-------|
| Chloride                 | 21.53 | 0.500 | 10 | 11.83 | 97.0 | 80 - 120 | 21.88 | 1.58  | 20    |
| Nitrogen, Nitrate (As N) | 3.473 | 0.100 | 2  | 1.417 | 103  | 80 - 120 | 3.495 | 0.631 | 20    |
| Nitrogen, Nitrite (As N) | 2.073 | 0.100 | 2  | 0     | 104  | 80 - 120 | 2.106 | 1.58  | 20    |
| Sulfate                  | 70.73 | 0.500 | 10 | 63.26 | 74.6 | 80 - 120 | 71.91 | 1.66  | 20 SO |

|            |                             |                |         |                                  |   |
|------------|-----------------------------|----------------|---------|----------------------------------|---|
| <b>MSD</b> | Sample ID: HS18101179-04MSD | Units: mg/L    |         | Analysis Date: 25-Oct-2018 02:09 |   |
| Client ID: | Run ID: ICS2100_326431      | SeqNo: 4796282 |         | PrepDate:                        | DF: 10  |
| Analyte    | Result                      | PQL            | SPK Val | SPK Ref Value %REC               | Control Limit RPD Ref Value %RPD RPD Limit Qual |

|                          |       |      |     |       |     |          |       |       |    |
|--------------------------|-------|------|-----|-------|-----|----------|-------|-------|----|
| Chloride                 | 142.8 | 5.00 | 100 | 40.55 | 102 | 80 - 120 | 141.9 | 0.654 | 20 |
| Nitrogen, Nitrate (As N) | 20.56 | 1.00 | 20  | 0     | 103 | 80 - 120 | 20.5  | 0.292 | 20 |
| Nitrogen, Nitrite (As N) | 21.31 | 1.00 | 20  | 0     | 107 | 80 - 120 | 21.14 | 0.829 | 20 |
| Sulfate                  | 292.3 | 5.00 | 100 | 191   | 101 | 80 - 120 | 290.7 | 0.563 | 20 |

The following samples were analyzed in this batch: HS18101278-04 HS18101278-05 HS18101278-06

**ALS Houston, US**

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**WorkOrder:** HS18101278

**QUALIFIERS,  
ACRONYMS, UNITS**

| <b>Qualifier</b> | <b>Description</b>  |
|------------------|---|
| *                | Value exceeds Regulatory Limit  |
| a                | Not accredited  |
| B                | Analyte detected in the associated Method Blank above the Reporting Limit |
| E                | Value above quantitation range  |
| H                | Analyzed outside of Holding Time  |
| J                | Analyte detected below quantitation limit                                 |
| M                | Manually integrated, see raw data for justification                       |
| n                | Not offered for accreditation   |
| ND               | Not Detected at the Reporting Limit                                       |
| O                | Sample amount is > 4 times amount spiked                                  |
| P                | Dual Column results percent difference > 40%                              |
| R                | RPD above laboratory control limit  |
| S                | Spike Recovery outside laboratory control limits                          |
| U                | Analyzed but not detected above the MDL/SDL                               |

| <b>Acronym</b> | <b>Description</b>                  |
|----------------|-------------------------------------|
| DCS            | Detectability Check Study           |
| DUP            | Method Duplicate                    |
| LCS            | Laboratory Control Sample           |
| LCSD           | Laboratory Control Sample Duplicate |
| MBLK           | Method Blank                        |
| MDL            | Method Detection Limit              |
| MQL            | Method Quantitation Limit           |
| MS             | Matrix Spike                        |
| MSD            | Matrix Spike Duplicate              |
| PDS            | Post Digestion Spike                |
| PQL            | Practical Quantitation Limit        |
| SD             | Serial Dilution                     |
| SDL            | Sample Detection Limit              |
| TRRP           | Texas Risk Reduction Program        |

| <b>Unit Reported</b> | <b>Description</b>   |
|----------------------|----------------------|
| mg/L                 | Milligrams per Liter |

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**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

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| <b>Agency</b>   | <b>Number</b>     | <b>Expire Date</b> |
|-----------------|-------------------|--------------------|
| North Carolina  | 624-2018          | 31-Dec-2018        |
| Arkansas        | 88-0356           | 27-Mar-2019        |
| Texas           | T10470231-18-21   | 30-Apr-2019        |
| North Dakota    | R193 2018-2019    | 30-Apr-2019        |
| Illinois        | 004438            | 29-Jun-2019        |
| Louisiana       | 03087             | 30-Jun-2019        |
| Dept of Defense | ANAB L2231        | 22-Dec-2018        |
| Kentucky        | 123043 - 2018     | 30-Apr-2019        |
| Kansas          | E-10352 2018-2019 | 31-Jul-2019        |
| Oklahoma        | 2018-156          | 31-Aug-2019        |

## ALS Houston, US

Date: 03-Dec-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** LHAAP-67  
**Work Order:** HS18101278

## SAMPLE TRACKING

| Lab Samp ID   | Client Sample ID | Action | Date                   | Person | New Location |
|---------------|------------------|--------|------------------------|--------|--------------|
| HS18101278-01 | 67WW14-181022    | Login  | 10/24/2018 10:12:39 AM | JML    | VOA234       |
| HS18101278-02 | 67WW12-181022    | Login  | 10/24/2018 10:14:33 AM | JML    | VOA234       |
| HS18101278-03 | 67WW10-181022    | Login  | 10/24/2018 10:14:33 AM | JML    | VOA234       |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | WET118       |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | WET118       |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | WET118       |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | VOA234       |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | Sub          |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | Sub          |
| HS18101278-04 | 67WW13-181023    | Login  | 10/24/2018 10:14:33 AM | JML    | Sub          |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | VOA234       |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-05 | 67WW08-181023    | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | WET118       |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | VOA234       |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-06 | 67WW08-181023-FD | Login  | 10/24/2018 10:20:10 AM | JML    | Sub          |
| HS18101278-07 | 67WW11-181023    | Login  | 10/24/2018 10:53:58 AM | JML    | VOA234       |
| HS18101278-08 | 67WW09-181023    | Login  | 10/24/2018 10:53:58 AM | JML    | VOA234       |
| HS18101278-09 | 67WW15-181023    | Login  | 10/24/2018 10:53:58 AM | JML    | VOA234       |

ALS Houston, US

Date: 03-Dec-18

## Sample Receipt Checklist

Client Name: CBI-Houston  
 Work Order: HS18101278

Date/Time Received: **24-Oct-2018 08:55**  
 Received by: **JRM**

Checklist completed by: Jared R. Makan 24-Oct-2018 Reviewed by: RJ Modashia 25-Oct-2018  
 eSignature Date eSignature Date

Matrices: **Water**Carrier name: **FedEx Priority Overnight**

|   |   |  |   |
|---|---|--|---|
| Shipping container/cooler in good condition?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on shipping container/cooler?      | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on sample bottles?                 | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Chain of custody agrees with sample labels?             | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |   |
| Samples in proper container/bottle?                     | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Sample containers intact?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| TX1005 solids received in hermetically sealed vials?    | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | N/A <input checked="" type="checkbox"/>         |
| Sufficient sample volume for indicated test?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| All samples received within holding time?               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Container/Temp Blank temperature in compliance?         | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |

Temperature(s)/Thermometer(s): 2.0c/1.6c UC/C IR11

Cooler(s)/Kit(s): 2759

Date/Time sample(s) sent to storage: 10/24/2018 10:56

Water - VOA vials have zero headspace? Yes ☒ No ☐ No VOA vials submitted ☐

Water - pH acceptable upon receipt? Yes ☒ No ☐ N/A ☐

pH adjusted? Yes ☐ No ☒ N/A ☐

pH adjusted by:


Login Notes: Trip Blank received, not listed on COC. Placed on hold.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

| <b>APTIM</b>   |          | Page 1 of _____          |           |            |                             |                         |               |                                |                         |  |                                   |  |                           |                        |                        |                            |                      |              |              |
|--|----------|--------------------------|-----------|------------|-----------------------------|-------------------------|---------------|--------------------------------|-------------------------|--|-----------------------------------|--|---------------------------|------------------------|------------------------|----------------------------|----------------------|--------------|--------------|
| COC ID:  |          | 67-OCT2018-GW-ALSHT-1810 |           |            |                             | TURNAROUND TIME: normal |               |                                |                         | RUSII:   |                                   |  |                           |                        |                        |                            |                      |              |              |
| <b>PROJECT/CLIENT INFO</b>                                     |          |                          |           |            |                             |                         |               |                                |                         | <b>LABORATORY</b>  |                                   |  |                           | <b>OTHER INFO</b>      |                        |                            |                      |              |              |
| Facility Name  |          | Longhorn AAP             |           |            |                             | Lab Name                |               | ALS Laboratories               |                         | Email Invoice To   |                                   | FedInvoices@CBIFederalServices.com         |                           |                        |                        |                            |                      |              |              |
| Project Number   |          | 501032                   |           |            |                             | Lab Contact             |               | RJ Modashia                    |                         |  |                                   |  |                           |                        |                        |                            |                      |              |              |
|  |          | LHAAP-67                 |           |            |                             | Email                   |               | RJ.Modashia@alsglobal.com      |                         | Email Report To  |                                   | Kim.napier@aptim.com                       |                           |                        |                        |                            |                      |              |              |
| Address  |          | 1203-B East Grand Avenue |           |            |                             | Address                 |               | 10450 Stanchiff Rd., Suite 210 |                         | Mail Reports To  |                                   | Kim Napier                                 |                           |                        |                        |                            |                      |              |              |
|  |          | PMB 202                  |           |            |                             |                         |               |                                |                         | Address  |                                   | 2410 Cherahala Blvd.                       |                           |                        |                        |                            |                      |              |              |
| City   |          | Marshall                 |           | State      | TX                          | City                    |               | Houston                        |                         | State  | TX                                | City                                       |                           | Knoxville              | State                  | TN                         |                      |              |              |
| Postal Code  |          | 75670                    |           | Country    | USA                         | Postal Code             |               | 77099                          |                         | Country  | USA                               | Postal Code                                |                           | 37932                  |                        | Country                    | USA                  |              |              |
| Phone Number   |          | 713.243.7264             |           |            |                             | Phone Number            |               | 281.575.2279 or 281.530.5656   |                         |  |                                   |  |                           |                        |                        |                            |                      |              |              |
| Project Manager  |          | Praveen Srivastav        |           |            |                             |                         |               |                                |                         | Shipping Company   |                                   |  |                           |                        |                        |                            |                      |              |              |
| <b>SAMPLE DETAILS</b>  |          |                          |           |            |                             |                         |               |                                |                         | <b>ANALYSIS REQUESTED</b>  |                                   |  |                           |                        |                        |                            |                      |              |              |
| Sample ID  | Location | Start Depth              | End Depth | Depth Unit | Field Matrix                | Date                    | Time (24hr)   | # Of Cont.                     | ANALYSIS                | VOCs in Water by 8260B   | Carbon Dioxide in Water by RSK175 | Methane, Ethane, Ethene in Water by RSK175 | Anions in Water by E300.0 | TOC in Water by E415.1 | TIC in Water by E415.1 | Sulfide in Water by E376.1 | Alkalinity by E310.1 | Fe2005 T-00A | Sm 350- FE-B |
| 67WW14-181022  | LHAAP 67 | 20.85                    | 21.08     |            | WG                          | 10/22/18                | 1255          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
| 67WW12-181022  | LHAAP 67 | 26.30                    | 26.55     |            | WG                          | 10/22/18                | 1345          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
| 67WW10-181022  | LHAAP 67 | 25.65                    | 25.88     |            | WG                          | 10/24/18                | 1435          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
| 67WW13-181023  | LHAAP 67 | 22.38                    | 22.62     |            | WG                          | 10/23/18                | 0935          | 13                             |                         | X  | X                                 | X  | X                         | X                      | X                      | X                          | X                    | X            | X            |
| 67WW08-181023  | LHAAP 67 | 24.41                    | 24.62     |            | WG                          | 10/23/18                | 1045          | 13                             |                         | X  | X                                 | X  | X                         | X                      | X                      | X                          | X                    | X            | X            |
| 67WW08-181023-FD   | LHAAP 67 | 24.41                    | 24.62     |            | WG                          | 10/23/18                | 1045          | 13                             |                         | X  | X                                 | X  | X                         | X                      | X                      | X                          | X                    | X            | X            |
| 67WW11-181023  | LHAAP 67 | 23.45                    | 24.20     |            | WG                          | 10/23/18                | 1155          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
| 67WW09-181023  | LHAAP 67 | 22.43                    | 22.65     |            | WG                          | 10/23/18                | 1245          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
| 67WW15-181023  | LHAAP 67 | 24.23                    | 24.44     |            | WG                          | 10/23/18                | 1335          | 3                              |                         | X  |                                   |  |                           |                        |                        |                            |                      |              |              |
|  |          |                          |           |            |                             |                         |               |                                |                         | <b>HS18101278</b><br>Aptim Environmental & Infrastructure, Inc.<br>LHAAP-67<br> |                                   |  |                           |                        |                        |                            |                      |              |              |
| ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS                       |          |                          |           |            | RELINQUISHED BY/AFFILIATION |                         | DATE/TIME     |                                | ACCEPTED BY/AFFILIATION |  |                                   | DATE/TIME                                  |                           |                        |                        |                            |                      |              |              |
| Anions should include chloride, nitrate, nitrite, and sulfate. |          |                          |           |            | Santia Bellin/BHATE         |                         | 10/23/18 1430 |                                | NO                      |  |                                   | 10/24/18 09:55                             |                           |                        |                        |                            |                      |              |              |
|  |          |                          |           |            |                             |                         |               |                                |                         |  |                                   |  |                           |                        |                        |                            |                      |              |              |
|  |          |                          |           |            |                             |                         |               |                                |                         |  |                                   |  |                           |                        |                        |                            |                      |              |              |

cooling HT 2759

Temp 41C 2.0 100% CH -0.4







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ALS Environmental  
ALS Group USA, Corp  
1317 South 13th Avenue  
Kelso, WA 98626  
T : 1 360 577 7222  
F : 1 360 636 1068  
[www.alsglobal.com](http://www.alsglobal.com)

November 30, 2018

**Analytical Report for Service Request No: K1810527**

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road  
Suite 210  
Houston, TX 77099-4338

**RE: HS18101278**

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 27, 2018  
For your reference, these analyses have been assigned our service request number **K1810527**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3350. You may also contact me via email at [Kelley.Lovejoy@alsglobal.com](mailto:Kelley.Lovejoy@alsglobal.com).

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

Kelley Lovejoy  
Project Manager



---

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    General Chemistry

## Acronyms

|            |  |
|------------|--|
| ASTM       | American Society for Testing and Materials   |
| A2LA       | American Association for Laboratory Accreditation  |
| CARB       | California Air Resources Board   |
| CAS Number | Chemical Abstract Service registry Number  |
| CFC        | Chlorofluorocarbon   |
| CFU        | Colony-Forming Unit  |
| DEC        | Department of Environmental Conservation   |
| DEQ        | Department of Environmental Quality  |
| DHS        | Department of Health Services  |
| DOE        | Department of Ecology  |
| DOH        | Department of Health   |
| EPA        | U. S. Environmental Protection Agency  |
| ELAP       | Environmental Laboratory Accreditation Program   |
| GC         | Gas Chromatography   |
| GC/MS      | Gas Chromatography/Mass Spectrometry   |
| LOD        | Limit of Detection   |
| LOQ        | Limit of Quantitation  |
| LUFT       | Leaking Underground Fuel Tank  |
| M          | Modified   |
| MCL        | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL        | Method Detection Limit   |
| MPN        | Most Probable Number   |
| MRL        | Method Reporting Limit   |
| NA         | Not Applicable   |
| NC         | Not Calculated   |
| NCASI      | National Council of the Paper Industry for Air and Stream Improvement  |
| ND         | Not Detected   |
| NIOSH      | National Institute for Occupational Safety and Health  |
| PQL        | Practical Quantitation Limit   |
| RCRA       | Resource Conservation and Recovery Act   |
| SIM        | Selected Ion Monitoring  |
| TPH        | Total Petroleum Hydrocarbons   |
| tr         | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.                           |

**Inorganic Data Qualifiers**

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

**Metals Data Qualifiers**

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

**Organic Data Qualifiers**

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

**Additional Petroleum Hydrocarbon Specific Qualifiers**

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**  
**State Certifications, Accreditations, and Licenses**

| <b>Agency</b>            | <b>Web Site</b>   | <b>Number</b> |
|--------------------------|---|---------------|
| Alaska DEH               | <a href="http://dec.alaska.gov/eh/lab/cs/csapproval.htm">http://dec.alaska.gov/eh/lab/cs/csapproval.htm</a>   | UST-040       |
| Arizona DHS              | <a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>   | AZ0339        |
| Arkansas - DEQ           | <a href="http://www.adeq.state.ar.us/techsvs/labcert.htm">http://www.adeq.state.ar.us/techsvs/labcert.htm</a>   | 88-0637       |
| California DHS (ELAP)    | <a href="http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx">http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx</a>   | 2795          |
| DOD ELAP                 | <a href="http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm">http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm</a>   | L16-58-R4     |
| Florida DOH              | <a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>   | E87412        |
| Hawaii DOH               | <a href="http://health.hawaii.gov/">http://health.hawaii.gov/</a>   | -             |
| ISO 17025                | <a href="http://www.pjllabs.com/">http://www.pjllabs.com/</a>   | L16-57        |
| Louisiana DEQ            | <a href="http://www.deq.louisiana.gov/page/la-lab-accreditation">http://www.deq.louisiana.gov/page/la-lab-accreditation</a>   | 03016         |
| Maine DHS                | <a href="http://www.maine.gov/dhhs/">http://www.maine.gov/dhhs/</a>   | WA01276       |
| Minnesota DOH            | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>   | 053-999-457   |
| Nevada DEP               | <a href="http://ndep.nv.gov/bsdwlabservice.htm">http://ndep.nv.gov/bsdwlabservice.htm</a>   | WA01276       |
| New Jersey DEP           | <a href="http://www.nj.gov/dep/enforcement/oqa.html">http://www.nj.gov/dep/enforcement/oqa.html</a>   | WA005         |
| New York - DOH           | <a href="https://www.wadsworth.org/regulatory/elap">https://www.wadsworth.org/regulatory/elap</a>   | 12060         |
| North Carolina DEQ       | <a href="https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification">https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification</a> | 605           |
| Oklahoma DEQ             | <a href="http://www.deq.state.ok.us/CSDnew/labcert.htm">http://www.deq.state.ok.us/CSDnew/labcert.htm</a>   | 9801          |
| Oregon – DEQ (NELAP)     | <a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>   | WA100010      |
| South Carolina DHEC      | <a href="http://www.scdhec.gov/environment/EnvironmentalLabCertification/">http://www.scdhec.gov/environment/EnvironmentalLabCertification/</a>   | 61002         |
| Texas CEQ                | <a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>   | T104704427    |
| Washington DOE           | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>   | C544          |
| Wyoming (EPA Region 8)   | <a href="https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water">https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water</a>   | -             |
| Kelso Laboratory Website | <a href="http://www.alsglobal.com">www.alsglobal.com</a>  | NA            |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at [www.ALSGlobal.com](http://www.ALSGlobal.com) or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.





## Case Narrative

**ALS Environmental—Kelso Laboratory**  
1317 South 13th Avenue, Kelso, WA 98626  
Phone (360)577- 7222 Fax (360)636-1 068  
[www.alsglobal.com](http://www.alsglobal.com)

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Received:** 10/27/2018

### CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

#### Sample Receipt:

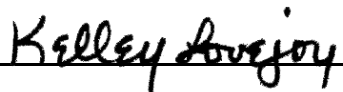
Three ground water samples were received for analysis at ALS Environmental on 10/27/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

#### General Chemistry:

Method SM 5310 C, 11/14/2018: The Relative Percent Difference (RPD) for the replicate analysis of Total Organic Carbon in samples 67WW13-181023, 67WW08-181023, and 67WW08-181023-FD were outside the normal ALS control limits (12% to 15% RPDs versus a control limit of 10%). The associated QA/QC results (e.g. control sample, matrix spike, method blank, calibration standards, etc.) indicate the analysis was in control. No further corrective action was appropriate.

Method SM 5310 C, 11/27,29/2018: Samples 67WW13-181023, 67WW08-181023, and 67WW08-181023-FD were analyzed past holding time due to laboratory labeling error. The unpreserved containers received for Total Inorganic Carbon were inadvertently labeled as preserved upon receipt. The samples were analyzed as soon as possible after the error was discovered. The data was flagged to indicate the holding time violation.

Approved by



Date

11/30/2018



## Chain of Custody

**ALS Environmental—Kelso Laboratory**  
1317 South 13th Avenue, Kelso, WA 98626  
Phone (360)577- 7222 Fax (360)636-1 068  
[www.alsglobal.com](http://www.alsglobal.com)



K1810527

00954662

10450 Stancliff Rd, Ste 210

Houston, TX 77099

T: +1 281 530 5656

F: +1 281 530 5887

www.alsglobal.com

**Subcontract Chain of Custody****COC ID: 10112****SUBCONTRACT TO:**

ALS Environmental Kelso  
1317 S. 13th Avenue  
Kelso, WA 98626

**Phone:** +1 360 501 3312**CUSTOMER  
INFORMATION:**

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate  
Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

**INVOICE  
INFORMATION:**

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS18101278  
**TSR:** Sonia West

|    | LAB SAMPLE ID                  | CLIENT SAMPLE ID | MATRIX      | COLLECT DATE      |
|----|--------------------------------|------------------|-------------|-------------------|
|    | ANALYSIS REQUESTED             |                  |             | DUE DATE          |
| 1. | HS18101278-04                  | 67WW13-181023    | Groundwater | 23 Oct 2018 09:35 |
|    | TIC Analysis with Level IV     |                  |             | 01 Nov 2018       |
|    | TOC Analysis with DOD Level IV |                  |             | 01 Nov 2018       |
| 2. | HS18101278-05                  | 67WW08-181023    | Groundwater | 23 Oct 2018 10:45 |
|    | TIC Analysis with Level IV     |                  |             | 01 Nov 2018       |
|    | TOC Analysis with DOD Level IV |                  |             | 01 Nov 2018       |
| 3. | HS18101278-06                  | 67WW08-181023-FD | Groundwater | 23 Oct 2018 10:45 |
|    | TIC Analysis with Level IV     |                  |             | 01 Nov 2018       |
|    | TOC Analysis with DOD Level IV |                  |             | 01 Nov 2018       |

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)

Relinquished By: Pats Moiny

Date/Time: 10-26-18 15:40

Received By: [Signature] DAWIA PUNZON

Date/Time: 10-27-18 08:15

Cooler ID(s): \_\_\_\_\_

Temperature(s): \_\_\_\_\_

RIGHT SOLUTIONS | RIGHT PARTNER

10/26/2018

10/27/2018



## Cooler Receipt and Preservation Form

Client ALS Houston Service Request K18 10527  
Received: 10-27-18 Opened: 10-27-18 By: ASP Unloaded: 10-27-18 By: ASP

1. Samples were received via? USPS Fed Ex UPS DHL PDX Courier Hand Delivered  
2. Samples were received in: (circle) Cooler Box Envelope Other NA  
3. Were custody seals on coolers? NA Y N If yes, how many and where? 2 Top Front  
If present, were custody seals intact? Y N If present, were they signed and dated? Y N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID | Tracking Number | NA | Filed |
|-----------------|-----------------------|----------------|----------------------|--------------|----------------|---------------|-----------------|----|-------|
| -0.3            | -0.2                  | 0.7            | 0.8                  | +0.1         | 351            | 10112         | 4380 9534 0062  |    |       |
|                 |                       |                |                      |              |                |               |                 |    |       |
|                 |                       |                |                      |              |                |               |                 |    |       |
|                 |                       |                |                      |              |                |               |                 |    |       |
|                 |                       |                |                      |              |                |               |                 |    |       |

4. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves  
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N  
6. Were samples received in good condition (temperature, unbroken)? Indicate in the table below. NA Y N  
If applicable, tissue samples were received: Frozen Partially Thawed Thawed  
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N  
8. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2. NA Y N  
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N  
10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below NA Y N  
11. Were VOA vials received without headspace? Indicate in the table below. NA Y N  
12. Was C12/Res negative? NA Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---------------------|------------------|----------------|
|                     |                  |                |
|                     |                  |                |
|                     |                  |                |

| Sample ID | Bottle Count | Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|-----------|--------------|-------------|-------------|------------|-------|----|---------|--------------|--------------------|----------|------|
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |

Notes, Discrepancies, & Resolutions: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## General Chemistry

**ALS Environmental—Kelso Laboratory**  
1317 South 13th Avenue, Kelso, WA 98626  
Phone (360)577- 7222 Fax (360)636-1 068  
[www.alsglobal.com](http://www.alsglobal.com)

Analytical Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Service Request:** K1810527  
**Date Collected:** 10/23/18  
**Date Received:** 10/27/18  
**Units:** mg/L  
**Basis:** NA

**Carbon, Total Inorganic**

| Sample Name      | Lab Code     | Result | MRL | MDL | Dil. | Date Analyzed  | Q |
|------------------|--------------|--------|-----|-----|------|----------------|---|
| 67WW13-181023    | K1810527-001 | 130    | 100 | 50  | 50   | 11/27/18 15:27 | * |
| 67WW08-181023    | K1810527-002 | 55     | 40  | 20  | 20   | 11/29/18 19:50 | * |
| 67WW08-181023-FD | K1810527-003 | 58     | 40  | 20  | 20   | 11/27/18 16:48 | * |
| Method Blank     | K1810527-MB1 | ND U   | 2.0 | 1.0 | 1    | 11/27/18 15:05 |   |
| Method Blank     | K1810527-MB2 | ND U   | 2.0 | 1.0 | 1    | 11/29/18 19:35 |   |



## ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:**K1810527  
**Date Collected:**10/23/18  
**Date Received:**10/27/18

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:**mg/L  
**Basis:**NA

## Replicate Sample Summary

## Carbon, Total Inorganic

| Sample Name:     | Lab Code:        | MRL | MDL | Sample Result | Duplicate Result | Average | RPD | RPD Limit | Date Analyzed |
|------------------|------------------|-----|-----|---------------|------------------|---------|-----|-----------|---------------|
| 67WW13-181023    | K1810527-001DUP  | 100 | 50  | 130           | 130              | 131     | <1  | 10        | 11/27/18      |
| 67WW08-181023    | K1810527-002DUP2 | 40  | 20  | 55            | 57               | 56.0    | 3   | 10        | 11/29/18      |
| 67WW08-181023-FD | K1810527-003DUP1 | 40  | 20  | 58            | 59               | 58.3    | 2   | 10        | 11/27/18      |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Collected:** 10/23/18  
**Date Received:** 10/27/18  
**Date Analyzed:** 11/27/18  
**Date Extracted:** NA

**Matrix Spike Summary**  
**Carbon, Total Inorganic**

**Sample Name:** 67WW13-181023  
**Lab Code:** K1810527-001  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA

**Matrix Spike**  
K1810527-001MS

| Analyte Name            | Sample Result | Result | Spike Amount | % Rec | % Rec Limits |
|-------------------------|---------------|--------|--------------|-------|--------------|
| Carbon, Total Inorganic | 130           | 1410   | 1250         | 102   | 83-117       |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Collected:** 10/23/18  
**Date Received:** 10/27/18  
**Date Analyzed:** 11/29/18  
**Date Extracted:** NA

**Matrix Spike Summary**  
**Carbon, Total Inorganic**

**Sample Name:** 67WW08-181023  
**Lab Code:** K1810527-002  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA

**Matrix Spike**  
K1810527-002MS

| Analyte Name            | Sample Result | Result | Spike Amount | % Rec | % Rec Limits |
|-------------------------|---------------|--------|--------------|-------|--------------|
| Carbon, Total Inorganic | 55            | 543    | 500          | 98    | 83-117       |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Analyzed:** 11/27/18  
**Date Extracted:** NA

**Lab Control Sample Summary**  
**Carbon, Total Inorganic**

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA  
**Analysis Lot:** 616542

| <b>Sample Name</b> | <b>Lab Code</b> | <b>Result</b> | <b>Spike Amount</b> | <b>% Rec</b> | <b>% Rec Limits</b> |
|--------------------|-----------------|---------------|---------------------|--------------|---------------------|
| Lab Control Sample | K1810527-LCS1   | 25.9          | 25.0                | 104          | 83-117              |

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Analyzed:** 11/29/18  
**Date Extracted:** NA

**Lab Control Sample Summary**  
**Carbon, Total Inorganic**

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA  
**Analysis Lot:** 616903

| <b>Sample Name</b> | <b>Lab Code</b> | <b>Result</b> | <b>Spike Amount</b> | <b>% Rec</b> | <b>% Rec Limits</b> |
|--------------------|-----------------|---------------|---------------------|--------------|---------------------|
| Lab Control Sample | K1810527-LCS2   | 24.3          | 25.0                | 97           | 83-117              |

**Client:** ALS Environmental - US  
**Project:** HS18101278

**Service Request:** K1810527

### Continuing Calibration Verification (CCV) Summary

#### Carbon, Total Inorganic

**Analysis Method:** SM 5310 C

**Units:** mg/L

|      | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>True<br/>Value</b> | <b>Measured<br/>Value</b> | <b>Percent<br/>Recovery</b> | <b>Acceptance Limits</b> |
|------|-------------------------|-----------------|--------------------------|-----------------------|---------------------------|-----------------------------|--------------------------|
| CCV1 | 616542                  | KQ1817365-07    | 11/27/18 14:50           | 25.0                  | 25.0                      | 100                         | 90-110                   |
| CCV2 | 616542                  | KQ1817365-08    | 11/27/18 17:23           | 25.0                  | 25.0                      | 100                         | 90-110                   |
| CCV3 | 616903                  | KQ1817508-05    | 11/29/18 19:21           | 25.0                  | 24.8                      | 99                          | 90-110                   |
| CCV4 | 616903                  | KQ1817508-06    | 11/29/18 20:23           | 25.0                  | 24.5                      | 98                          | 90-110                   |

**Client:** ALS Environmental - US  
**Project:** HS18101278

**Service Request:** K1810527

**Continuing Calibration Blank (CCB) Summary**  
**Carbon, Total Inorganic**

**Analysis Method:** SM 5310 C

**Units:** mg/L

|      | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>MRL</b> | <b>MDL</b> | <b>Result</b> | <b>Q</b> |
|------|-------------------------|-----------------|--------------------------|------------|------------|---------------|----------|
| CCB1 | 616542                  | KQ1817365-09    | 11/27/18 14:57           | 2.0        | 1.0        | ND            | U        |
| CCB2 | 616542                  | KQ1817365-10    | 11/27/18 17:33           | 2.0        | 1.0        | ND            | U        |
| CCB3 | 616903                  | KQ1817508-07    | 11/29/18 19:28           | 2.0        | 1.0        | ND            | U        |
| CCB4 | 616903                  | KQ1817508-08    | 11/29/18 20:30           | 2.0        | 1.0        | ND            | U        |



Analytical Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Service Request:** K1810527  
**Date Collected:** 10/23/18  
**Date Received:** 10/27/18  
**Units:** mg/L  
**Basis:** NA

Carbon, Total Organic

| Sample Name      | Lab Code     | Result | LOQ  | LOD  | MDL  | Dil. | Date Analyzed  | Q |
|------------------|--------------|--------|------|------|------|------|----------------|---|
| 67WW13-181023    | K1810527-001 | 3.99   | 0.50 | 0.20 | 0.07 | 1    | 11/13/18 23:43 |   |
| 67WW08-181023    | K1810527-002 | 2.86   | 0.50 | 0.20 | 0.07 | 1    | 11/14/18 00:47 |   |
| 67WW08-181023-FD | K1810527-003 | 3.19   | 0.50 | 0.20 | 0.07 | 1    | 11/14/18 01:51 |   |
| Method Blank     | K1810527-MB1 | ND U   | 0.50 | 0.20 | 0.07 | 1    | 11/12/18 20:31 |   |
| Method Blank     | K1810527-MB2 | ND U   | 0.50 | 0.20 | 0.07 | 1    | 11/13/18 06:23 |   |
| Method Blank     | K1810527-MB3 | ND U   | 0.50 | 0.20 | 0.07 | 1    | 11/13/18 17:03 |   |

## ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project** HS18101278  
**Sample Matrix:** Ground Water  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Service Request:**K1810527  
**Date Collected:**10/23/18  
**Date Received:**10/27/18

**Units:**mg/L  
**Basis:**NA

**Replicate Sample Summary**  
**Carbon, Total Organic**

| Sample Name:     | Lab Code:        | MRL  | LOQ  | MDL  | Sample Result | Duplicate Result | Average | RPD  | RPD Limit | Date Analyzed |
|------------------|------------------|------|------|------|---------------|------------------|---------|------|-----------|---------------|
| 67WW13-181023    | K1810527-001DUP  | 0.50 | 0.20 | 0.07 | 3.99          | 3.42             | 3.71    | 15 * | 10        | 11/13/18      |
| 67WW08-181023    | K1810527-002DUP1 | 0.50 | 0.20 | 0.07 | 2.86          | 2.55             | 2.71    | 12 * | 10        | 11/14/18      |
| 67WW08-181023-FD | K1810527-003DUP1 | 0.50 | 0.20 | 0.07 | 3.19          | 2.78             | 2.98    | 14 * | 10        | 11/14/18      |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Collected:** 10/23/18  
**Date Received:** 10/27/18  
**Date Analyzed:** 11/14/18  
**Date Extracted:** NA

**Matrix Spike Summary**  
**Carbon, Total Organic**

**Sample Name:** 67WW13-181023  
**Lab Code:** K1810527-001  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA

**Matrix Spike**  
K1810527-001MS

| Analyte Name          | Sample Result | Result | Spike Amount | % Rec | % Rec Limits |
|-----------------------|---------------|--------|--------------|-------|--------------|
| Carbon, Total Organic | 3.99          | 29.1   | 25.0         | 101   | 83-117       |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Analyzed:** 11/12/18  
**Date Extracted:** NA

**Lab Control Sample Summary**  
**Carbon, Total Organic**

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA  
**Analysis Lot:** 614837

| Sample Name        | Lab Code      | Result | Spike Amount | % Rec | % Rec Limits |
|--------------------|---------------|--------|--------------|-------|--------------|
| Lab Control Sample | K1810527-LCS1 | 22.3   | 21.9         | 102   | 83-117       |
| Lab Control Sample | K1810527-LCS2 | 21.5   | 21.9         | 98    | 83-117       |

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS18101278  
**Sample Matrix:** Ground Water

**Service Request:** K1810527  
**Date Analyzed:** 11/13/18  
**Date Extracted:** NA

**Lab Control Sample Summary**  
**Carbon, Total Organic**

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA  
**Analysis Lot:** 614838

| <b>Sample Name</b> | <b>Lab Code</b> | <b>Result</b> | <b>Spike Amount</b> | <b>% Rec</b> | <b>% Rec Limits</b> |
|--------------------|-----------------|---------------|---------------------|--------------|---------------------|
| Lab Control Sample | K1810527-LCS3   | 21.6          | 21.9                | 99           | 83-117              |

**Client:** ALS Environmental - US  
**Project:** HS18101278

**Service Request:** K1810527

### Continuing Calibration Verification (CCV) Summary

#### Carbon, Total Organic

**Analysis Method:** SM 5310 C

**Units:** mg/L

|       | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>True<br/>Value</b> | <b>Measured<br/>Value</b> | <b>Percent<br/>Recovery</b> | <b>Acceptance Limits</b> |
|-------|-------------------------|-----------------|--------------------------|-----------------------|---------------------------|-----------------------------|--------------------------|
| CCV1  | 614837                  | KQ1816883-31    | 11/12/18 19:57           | 25.0                  | 25.5                      | 102                         | 90-110                   |
| CCV2  | 614837                  | KQ1816883-32    | 11/12/18 23:59           | 25.0                  | 25.1                      | 101                         | 90-110                   |
| CCV3  | 614837                  | KQ1816883-33    | 11/13/18 05:50           | 25.0                  | 25.1                      | 101                         | 90-110                   |
| CCV4  | 614837                  | KQ1816883-34    | 11/13/18 10:54           | 25.0                  | 25.0                      | 100                         | 90-110                   |
| CCV5  | 614837                  | KQ1816883-35    | 11/13/18 16:30           | 25.0                  | 25.1                      | 100                         | 90-110                   |
| CCV6  | 614837                  | KQ1816883-36    | 11/13/18 21:03           | 25.0                  | 25.5                      | 102                         | 90-110                   |
| CCV7  | 614838                  | KQ1816886-22    | 11/13/18 16:30           | 25.0                  | 25.1                      | 100                         | 90-110                   |
| CCV8  | 614838                  | KQ1816886-23    | 11/13/18 21:03           | 25.0                  | 25.5                      | 102                         | 90-110                   |
| CCV9  | 614838                  | KQ1816886-24    | 11/14/18 02:23           | 25.0                  | 25.2                      | 101                         | 90-110                   |
| CCV10 | 614838                  | KQ1816886-25    | 11/14/18 07:59           | 25.0                  | 24.9                      | 100                         | 90-110                   |

**Client:** ALS Environmental - US  
**Project:** HS18101278

**Service Request:** K1810527

**Continuing Calibration Blank (CCB) Summary**  
**Carbon, Total Organic**

**Analysis Method:** SM 5310 C

**Units:** mg/L

|       | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>LOQ</b> | <b>LOD</b> | <b>MDL</b> | <b>Result</b> | <b>Q</b> |
|-------|-------------------------|-----------------|--------------------------|------------|------------|------------|---------------|----------|
| CCB1  | 614837                  | KQ1816883-37    | 11/12/18 20:14           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB2  | 614837                  | KQ1816883-38    | 11/13/18 00:16           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB3  | 614837                  | KQ1816883-39    | 11/13/18 06:06           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB4  | 614837                  | KQ1816883-40    | 11/13/18 11:11           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB5  | 614837                  | KQ1816883-41    | 11/13/18 16:46           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB6  | 614837                  | KQ1816883-42    | 11/13/18 21:20           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB7  | 614838                  | KQ1816886-26    | 11/13/18 16:46           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB8  | 614838                  | KQ1816886-27    | 11/13/18 21:20           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB9  | 614838                  | KQ1816886-28    | 11/14/18 02:39           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB10 | 614838                  | KQ1816886-29    | 11/14/18 08:15           | 0.50       | 0.20       | 0.07       | ND            | U        |





## Raw Data

**ALS Environmental—Kelso Laboratory**  
1317 South 13th Avenue, Kelso, WA 98626  
Phone (360)577-7222 Fax (360)636-1068  
[www.alsglobal.com](http://www.alsglobal.com)



## General Chemistry

**ALS Environmental—Kelso Laboratory**  
1317 South 13th Avenue, Kelso, WA 98626  
Phone (360)577- 7222 Fax (360)636-1 068  
[www.alsglobal.com](http://www.alsglobal.com)

Work Request # (Original) K1810527  
 Tier: IV  
 Date Analyzed: 11/27/18  
 Analyst: CES Run # 616542  
 Analysis: TIC

### DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

- |     |   |           |
|-----|---|-----------|
| 1.  | Is the method name and number correct and appropriate?  | yes/no/NA |
| 2.  | Holding times met for all analyses and for all samples?   | yes/no/NA |
| 3.  | Are calculations correct?   | yes/no/NA |
| 4.  | Is the reporting basis correct? (Dry Weight)  | yes/no/NA |
| 5.  | All quality control criteria met?   | yes/no    |
| 6.  | Is the calibration curve correlation coefficient $\geq 0.995$ ?   | yes/no/NA |
| 7.  | MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?  | yes/no/NA |
| 8.  | Are ICVs, CCVs, and CCBs all within acceptance limits?  | yes/no/NA |
| 9.  | Are results for methods blanks all ND?  | yes/no/NA |
| 10. | Are all QC samples within acceptance criteria?<br>(LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)               | yes/no/NA |
| 11. | Are all exceptions explained?   | yes/no/NA |
| 12. | Have all applicable service requests been reviewed?   | yes/no/NA |
| 13. | Are all samples labeled correctly?  | yes/no/NA |
| 14. | Have all instructions on the service request been followed?<br>(e.g. Special MRLs, QC on a specific sample, Form V) | yes/no/NA |
| 15. | Are detection limits and units reported correctly?  | yes/no/NA |
| 16. | Is the unused space on the benchsheet crossed out?  | yes/no/NA |
| 17. | Was analysis turned in by the due date? (n-2) (If not record SR#)   | yes/no/NA |

#### COMMENTS:

RA 0527-2 over diluted

Final Approved by: [Signature] Date: 11/28/18 DQREPORT

## Analytical Results Summary

00954683

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot: 616542 Method/Testcode: SM 5310 C/TIC

| Lab Code     | Target Analytes         | QC  | Parent Sample | Matrix       | Raw Result        | Sample Amt. | Final Result | Dil | MDL | PQL | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-------------------------|-----|---------------|--------------|-------------------|-------------|--------------|-----|-----|-----|-------|-------|----------------|-----|------|
| K1810527-001 | Carbon, Total Inorganic | N/A |               | Ground Water | 2.61 mg/L         | 10 ml       | 130 mg/L     | 50  | 50  | 100 |       |       | 11/27/18 15:27 | N   | IV   |
| K1810527-002 | Carbon, Total Inorganic | N/A |               | Ground Water | 1.24 mg/L         | 10 ml       | 100 mg/L U   | 50  | 50  | 100 |       |       | 11/27/18 16:12 | N   | IV   |
| K1810527-003 | Carbon, Total Inorganic | N/A |               | Ground Water | 2.88 mg/L         | 10 ml       | 58 mg/L      | 20  | 20  | 40  |       |       | 11/27/18 16:48 | N   | IV   |
| KQ1817365-01 | Carbon, Total Inorganic | MS  | K1810527-001  | Ground Water | 28.18 mg/L        | 10 ml       | 1410 mg/L    | 50  | 50  | 100 | 102   |       | 11/27/18 15:44 | N   | IV   |
| KQ1817365-02 | Carbon, Total Inorganic | DUP | K1810527-001  | Ground Water | 2.62 mg/L         | 10 ml       | 130 mg/L     | 50  | 50  | 100 |       | <1    | 11/27/18 15:27 | N   | IV   |
| KQ1817365-03 | Carbon, Total Inorganic | DUP | K1810527-002  | Ground Water | 1.29 mg/L         | 10 ml       | 60 mg/L J    | 50  | 50  | 100 |       | NC    | 11/27/18 16:12 | N   | IV   |
| KQ1817365-04 | Carbon, Total Inorganic | DUP | K1810527-003  | Ground Water | 2.95 mg/L         | 10 ml       | 59 mg/L      | 20  | 20  | 40  |       | 2     | 11/27/18 16:48 | N   | IV   |
| KQ1817365-05 | Carbon, Total Inorganic | MB  |               | Ground Water | 1.49999999999997E | 10 ml       | 2.0 mg/L U   | 1   | 1.0 | 2.0 |       |       | 11/27/18 15:05 | N   | IV   |
| KQ1817365-06 | Carbon, Total Inorganic | LCS |               | Ground Water | 25.95 mg/L        | 10 ml       | 25.9 mg/L    | 1   | 1.0 | 2.0 | 104   |       | 11/27/18 15:12 | N   | IV   |
| KQ1817365-07 | Carbon, Total Inorganic | CCV |               | Ground Water | 25.02 mg/L        | 10 ml       | 25.0 mg/L    | 1   |     |     | 100   |       | 11/27/18 14:50 | N   | IV   |
| KQ1817365-08 | Carbon, Total Inorganic | CCV |               | Ground Water | 24.99 mg/L        | 10 ml       | 25.0 mg/L    | 1   |     |     | 100   |       | 11/27/18 17:23 | N   | IV   |
| KQ1817365-09 | Carbon, Total Inorganic | CCB |               | Ground Water | 0.00 mg/L         | 10 ml       | 2.0 mg/L U   | 1   | 1.0 | 2.0 |       |       | 11/27/18 14:57 | N   | IV   |
| KQ1817365-10 | Carbon, Total Inorganic | CCB |               | Ground Water | 0.04 mg/L         | 10 ml       | 2.0 mg/L U   | 1   | 1.0 | 2.0 |       |       | 11/27/18 17:33 | N   | IV   |

11/28/18

[Signature]

CES 11/28/18

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 11/28/18 13:26

Results Summary  
62 of 100

Page 1 of 1



[illegible]

TIC: 616542

**Schedule: 11272018****Version:** 11**Instrument:** Fusion1**Last Saved by:** Fusion1 (Fusion1)**Last Saved on:** 2018/11/27 16:32 - Tuesday

| Position | Sample Type    | Sample ID                  | Method ID (Calibration ID) | Reps | Use   | State |
|----------|----------------|----------------------------|----------------------------|------|-------|-------|
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| D        | Sample         | RB                         | IC 030411 (IC 030411)      | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| D        | Sample         | RB                         | IC 030411 (IC 030411)      | 1    | True  | Ready |
| (Blank)  | Blank          | Reagent/Acid Blank         |                            | 1    | True  | Ready |
| D        | Sample         | RB                         | IC 030411 (IC 030411)      | 2    | True  | Ready |
| A        | Check Standard | [IC] CCV 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| D        | Check Standard | [IC] CCB 030411 [0.0 ppm]  | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 1        | Sample         | MB1                        | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 2        | Check Standard | [IC] LCS 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 3        | Sample         | RB                         | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 4        | Sample         | K1810527-001.02 50x        | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 5        | Sample         | K1810527-001.02 ms 50x     | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 6        | Sample         | RB                         | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 7        | Sample         | K1810527-002.04 50x        | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 8        | Sample         | RB                         | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 9        | Sample         | K1810527-003.03 20x        | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 10       | Sample         | RB                         | IC 030411 (IC 030411)      | 2    | True  | Ready |
| A        | Check Standard | [IC] CCV 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| D        | Check Standard | [IC] CCB 030411 [0.0 ppm]  | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 1        | Sample         |                            | IC 030411 (IC 030411)      | 1    | True  | Ready |
|          |                |                            |                            |      | False |       |

11/28/18  


# Fusion Report - 11272018 Tuesday, November 27, 2018 12:01 PM

(View - Reps, Unused Reps, Meta-  
Data, Signature, History)  
Printed on 2018/11/27 17:49 -  
Tuesday

## Report Summary Information

Company Location: Gen Chem Lab  
Schedule Name: 11272018  
Instrument Name: Fusion1  
Report Version: 1 of 1  
Report Creation by Operators (schedule version): Fusion1 (Fusion1) (v6)  
Fusion1 (Fusion1) (v8)  
Fusion1 (Fusion1) (v10)  
Fusion1 (Fusion1) (v11)  
Comment:  
Engine Version: 1.1.5.1  
Firmware Version: 1.2.0696  
Connection: RS232 COM1

## Report Results

11/28/18  
Hump

Sample Type: Clean

From Schedule Version 6

|       | Pos                | Analysis Type  | Sample ID  |                |                 | Start Time       |
|-------|--------------------|----------------|------------|----------------|-----------------|------------------|
| ◆     | (clean)            |                | Clean      |                |                 | 2018/11/27 12:01 |
| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time         |
| 1     | IC Clean           | 7.32           | 10.63      | 3.32           | 49.28           | 05:28            |
|       |                    |                |            |                |                 |                  |
| 2     | TC Clean           | 5.73           | 8.32       | 2.59           | 49.83           | 07:17            |
| 3     | TC Clean           | 2.74           | 5.54       | 2.80           | 49.84           | 06:59            |
| 4     | TC Clean           | 2.30           | 4.95       | 2.65           | 49.89           | 07:02            |

Sample Type: Clean

From Schedule Version 8

|   | Pos     | Analysis Type      | Sample ID      |            |                | Start Time       |          |
|---|---------|--------------------|----------------|------------|----------------|------------------|----------|
| ◆ | (clean) |                    | Clean          |            |                | 2018/11/27 12:33 |          |
|   | Rep #   | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
|   | 1       | IC Clean           | 0.94           | 3.39       | 2.45           | 49.29            | 05:17    |
|   | 2       | TC Clean           | 5.15           | 7.92       | 2.77           | 49.85            | 07:17    |
|   | 3       | TC Clean           | 3.04           | 5.61       | 2.58           | 49.87            | 07:04    |
|   |         |                    |                |            |                |                  |          |



|   |          |      |      |      |       |       |
|---|----------|------|------|------|-------|-------|
| 4 | TC Clean | 2.96 | 5.78 | 2.82 | 49.85 | 07:01 |
|---|----------|------|------|------|-------|-------|

**Sample Type:** Sample

From Schedule Version 10

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | D   | IC            | RB        | 0.1315 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/27 13:04 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.1315 | 0.5261 | 3.46           | 6.39       | 2.93           | 49.11           | 04:56    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.5279 (IC)  
(v1190)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**Sample Type:** Clean

From Schedule Version 10

|   | Pos     | Analysis Type | Sample ID | Start Time       |
|---|---------|---------------|-----------|------------------|
| ◆ | (clean) |               | Clean     | 2018/11/27 13:11 |

| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|----------------|------------|----------------|-----------------|----------|
| 1     | IC Clean           | 6.79           | 9.47       | 2.68           | 49.34           | 05:27    |

|   |          |      |      |      |       |       |
|---|----------|------|------|------|-------|-------|
| 2 | TC Clean | 5.55 | 8.44 | 2.89 | 49.83 | 07:16 |
| 3 | TC Clean | 2.23 | 4.96 | 2.73 | 49.87 | 07:01 |
| 4 | TC Clean | 2.05 | 4.78 | 2.73 | 49.88 | 07:01 |

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◇   | D             | IC        | RB            | 0.0882 ppm       | 0.0000% | 2018/11/27 13:43 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.0882 | 0.3529 | 2.83           | 5.80       | 2.97           | 49.08           | 04:59    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.5279 (IC)  
(v1190)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**Sample Type:** Blank (Creating v1191)

From Schedule Version 10

| Pos |         | Analysis Type | Sample ID          | Start Time       |
|-----|---------|---------------|--------------------|------------------|
| ◆   | (blank) |               | Reagent/Acid Blank | 2018/11/27 13:50 |

| Rep | Base Analysis | Adjusted | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-----|---------------|----------|------------|----------------|-----------------|----------|
|-----|---------------|----------|------------|----------------|-----------------|----------|

| # | Type          | (Abs) |      |      |             |
|---|---------------|-------|------|------|-------------|
| 1 | IC Clean      | 6.39  | 9.10 | 2.71 | 49.28 05:29 |
| 2 | TC Clean      | 4.22  | 6.98 | 2.76 | 49.87 07:18 |
| 3 | TC Clean      | 2.03  | 4.79 | 2.77 | 49.89 07:01 |
| 4 | TC Clean      | 2.31  | 4.97 | 2.66 | 49.90 07:01 |
| 5 | Reagent Blank | 4.25  | 6.92 | 2.67 | 49.93 08:11 |
| 6 | Acid Blank    | 1.10  | 3.79 | 2.69 | 49.28 05:36 |

Sample Type: Sample

From Schedule Version 10

|       | Pos                | Analysis Type | Sample ID | Result (ppmC)  | Std. Dev. (ppmC) | RSD            | Start Time       |          |
|-------|--------------------|---------------|-----------|----------------|------------------|----------------|------------------|----------|
| ◆     | D                  | IC            | RB        | 0.0894 ppm     | 0.0232 ppm       | 25.9000%       | 2018/11/27 14:37 |          |
| Rep # | Base Analysis Type | ppm           | μg        | Adjusted (Abs) | NDIR (Abs)       | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | IC                 | 0.0731        | 0.2923    | 2.79           | 5.74             | 2.95           | 49.15            | 04:59    |
| 2     | IC                 | 0.1058        | 0.4233    | 3.27           | 5.70             | 2.43           | 49.17            | 04:58    |

Dilution

1:2

Blank Contribution(TC) 1.7149 (IC)  
(v1191)Method

IC 030411 (v3)

Calibration

IC 030411 (v13)

Sample Type: Check Standard --> CCV 030411

From Schedule Version 10

| Pos | BAT                | Concentration (ppm) | Dil   | Sample ID                  | Min / Max (% dev)        | Result             | Std. Dev.  | RSD               | Start Time       |
|-----|--------------------|---------------------|-------|----------------------------|--------------------------|--------------------|------------|-------------------|------------------|
| ◆ A | IC                 | 25.0000             | 1:1   | [IC] CCV 030411 [25.0 ppm] | 0 / infinity ( NA / NA ) | 25.1088 ppm (PASS) | 0.0000 ppm | 0%                | 2018/11/27 14:50 |
| Pos | Base Analysis Type | ID                  | Rep # | ppm                        | µg                       | Adjusted           | NDIR       | Baseline Pressure | Run Time         |
| A   | IC                 | 25.0 ppm            | 1     | 25.1088                    | 100.4352                 | 371.78             | 374.43     | 2.66              | 49.14 04:56      |

Completion State

Success - Criteria met.

Success Action

Do Nothing

Method

IC 030411 (v3)

Calibration

IC 030411 (v13)

STD Conc - Pos A

25 ppmC

Sample Type: Check Standard --> CCB 030411

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|-------------------|------------|-----|------------------|
| ◆ D | IC  | DI Water [0]        | DI  | [IC] CCB 030411 [0.0 ppm] | 0 / infinity (NA / NA) | 0.0935 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/27 14:57 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|------|-------------------|----------|
| D   | IC                 | 0.0 ppm | 1     | 0.0935 | 0.3739 | 3.71     | 6.50 | 2.80              | 04:40    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**STD Conc - Pos D**  
0 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 1   | IC            | MB1       | 0.0938 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/27 15:05 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.0938 | 0.3752 | 3.10           | 5.86       | 2.76           | 49.12           | 05:02    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**Sample Type:** Check Standard --> LCS 030411

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|------------------------|--------------------|------------|-----|------------------|
| 2   | IC  | 25.0000             | 1:1 | [IC] LCS 030411 [25.0 ppm] | 0 / infinity (NA / NA) | 26.0429 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/27 15:12 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline Pressure | Run Time    |
|-----|--------------------|----------|-------|---------|----------|----------|--------|-------------------|-------------|
| 2   | IC                 | 25.0 ppm | 1     | 26.0429 | 104.1716 | 385.52   | 388.53 | 3.01              | 49.20 05:02 |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**STD Conc - Pos 2**  
25 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 3   | IC            | RB        | 0.2719 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/27 15:19 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.2719 | 1.0875 | 5.72           | 8.64       | 2.93           | 49.19           | 05:00    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD | Start Time |
|-----|---------------|-----------|---------------|------------------|-----|------------|
|-----|---------------|-----------|---------------|------------------|-----|------------|

| 4     | IC                 | K1810527-001.02 50x |         | 2.7126 ppm     | 0.0064 ppm | 0.2400%        | 2018/11/27 15:27 |          |
|-------|--------------------|---------------------|---------|----------------|------------|----------------|------------------|----------|
| Rep # | Base Analysis Type | ppm                 | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | IC                 | 2.7081              | 10.8324 | 41.56          | 44.52      | 2.96           | 49.12            | 07:26    |
| 2     | IC                 | 2.7171              | 10.8686 | 41.69          | 44.52      | 2.82           | 49.10            | 07:28    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 5   | IC            | K1810527-001.02 ms 50x | 28.2704 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/27 15:44 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 28.2704 | 113.0816 | 417.68         | 420.50     | 2.82           | 49.03           | 07:32    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 6   | IC            | RB        | 0.3821 ppm    | 0.0066 ppm       | 1.7200% | 2018/11/27 15:54 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.3774 | 1.5096 | 7.27           | 10.33      | 3.06           | 49.00           | 07:24    |
| 2     | IC                 | 0.3867 | 1.5469 | 7.41           | 10.08      | 2.67           | 49.02           | 07:28    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 7   | IC            | K1810527-002.04 50x | 1.3579 ppm    | 0.0404 ppm       | 2.9800% | 2018/11/27 16:12 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 1.3293 | 5.3173 | 21.27          | 24.05      | 2.77           | 49.08           | 07:27    |
| 2     | IC                 | 1.3865 | 5.5459 | 22.12          | 24.71      | 2.59           | 49.10           | 07:26    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.7149 (IC)  
(v1191)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 8   | IC            | RB        | 0.5950 ppm    | 0.0202 ppm       | 3.4000% | 2018/11/27 16:30 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.5807 | 2.3228 | 10.26          | 13.00      | 2.75           | 49.08           | 07:24    |
| 2     | IC                 | 0.6093 | 2.4372 | 10.68          | 13.17      | 2.49           | 49.07           | 07:28    |

**Dilution**

**Blank Contribution**

**Method**

**Calibration**

1:2 (TC) 1.7149 (IC) IC 030411 (v3) IC 030411 (v13)  
(v1191)

**Sample Type:** Sample

From Schedule Version 11

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 9   | IC            | K1810527-003.03 20x | 3.0091 ppm    | 0.0475 ppm       | 1.5800% | 2018/11/27 16:48 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 2.9755 | 11.9021 | 45.50          | 48.29      | 2.80           | 49.14           | 07:27    |
| 2     | IC                 | 3.0428 | 12.1710 | 46.48          | 49.17      | 2.69           | 49.13           | 07:25    |

**Dilution**

1:2 **Blank Contribution** **Method** **Calibration**  
(TC) 1.7149 (IC) IC 030411 (v3) IC 030411 (v13)  
(v1191)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 10  | IC            | RB        | 0.5392 ppm    | 0.0200 ppm       | 3.7100% | 2018/11/27 17:06 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.5250 | 2.1001 | 9.44           | 12.41      | 2.97           | 49.16           | 07:28    |
| 2     | IC                 | 0.5533 | 2.2132 | 9.86           | 12.37      | 2.52           | 49.15           | 07:28    |

**Dilution**

1:2 **Blank Contribution** **Method** **Calibration**  
(TC) 1.7149 (IC) IC 030411 (v3) IC 030411 (v13)  
(v1191)

**Sample Type:** Check Standard --> CCV 030411

From Schedule Version 11

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|------------------------|--------------------|------------|-----|------------------|
| A   | IC  | 25.0000             | 1:1 | [IC] CCV 030411 [25.0 ppm] | 0 / infinity (NA / NA) | 25.0836 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/27 17:23 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|----------|----------|----------|
| A   | IC                 | 25.0 ppm | 1     | 25.0836 | 100.3344 | 371.40   | 374.25 | 2.85     | 49.16    | 07:25    |

**Completion State**

Success - Criteria met.

**Success Action**

Do Nothing

**Method**

IC 030411 (v3)

**Calibration**

IC 030411 (v13)

**STD Conc - Pos A**

25 ppmC

**Sample Type:** Check Standard --> CCB 030411

From Schedule Version 11

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|-------------------|------------|-----|------------------|
| D   | IC  | DI Water [0]        | DI  | [IC] CCB 030411 [0.0 ppm] | 0 / infinity (NA / NA) | 0.1294 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/27 17:33 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|------|----------|----------|----------|
| D   | IC                 | 0.0 ppm | 1     | 0.1294 | 0.5177 | 4.24     | 7.07 | 2.84     | 49.20    | 04:47    |

**Completion State**

Success - Criteria met.

**Success Action**

Do Nothing

**Method**

IC 030411 (v3)

**Calibration**

IC 030411 (v13)

**STD Conc - Pos D**

0 ppmC

**Sample Type:** Sample

From Schedule Version 11

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 1   | IC            |           | 0.1479 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/27 17:41 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.1479 | 0.5916 | 3.89           | 6.68       | 2.79           | 49.19           | 05:05    |

**Dilution**

1:2

**Blank Contribution**(TC) 1.7149 (IC)  
(v1191)**Method**

IC 030411 (v3)

**Calibration**

IC 030411 (v13)

**Meta Data Used in this Report****Blanks**

| Version | Reagent (Abs) | Acid (Abs) | DI IC (Abs) | DI TC (Abs) | DI TOC (Abs) | Save Time        | Operator          |
|---------|---------------|------------|-------------|-------------|--------------|------------------|-------------------|
| v1190   | 3.0817        | 0.7240     | 0.0000      | 0.0000      | 0.0000       | 2018/11/27 10:13 | Fusion1 (Fusion1) |
| v1191   | 1.4167        | 1.0980     | 0.0000      | 0.0000      | 0.0000       | 2018/11/27 14:37 | Fusion1 (Fusion1) |

**Calibrations****Name:** IC 030411 (IC)**Version:** v13Calibration curve formula:  
IC:  $y = 14.714x + 2.332$ **Ver Creation:** 2018/11/20 15:25 $r^2$  value:  
IC:  $r^2 = 0.99968$ **Comment:****Operator:** Fusion1 (Fusion1)**Basic Analysis Type:** IC**Basic Analysis Type:** IC

| Sample ID | Y Raw Value | X Expected | Message | End Time         |
|-----------|-------------|------------|---------|------------------|
| 0.0 ppm   | 4.3260      | 0.0000     |         | 2018/11/20 14:40 |
| 0.50 ppm  | 12.5220     | 0.5000     |         | 2018/11/20 14:47 |

about:blank

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11/27/2018

00954692

|          |          |         |                  |
|----------|----------|---------|------------------|
| 1.00 ppm | 20.0790  | 1.0000  | 2018/11/20 14:54 |
| 5.00 ppm | 74.7040  | 5.0000  | 2018/11/20 15:02 |
| 10.0 ppm | 146.8910 | 10.0000 | 2018/11/20 15:09 |
| 25.0 ppm | 360.9070 | 25.0000 | 2018/11/20 15:16 |
| 50.0 ppm | 743.1960 | 50.0000 | 2018/11/20 15:24 |

**Methods****Name:** IC 030411 (IC)**Version:** v3**Operator:** Gen Chem Lab (Fusion1)**Ver Creation:** 2013/02/04 11:47**Comment:**

| Parameter         | Value      | Advanced Parameter         | Value      |
|-------------------|------------|----------------------------|------------|
| SampleVolume      | 4.0 mL     | NeedleRinseVolume          | 5.0 ml     |
| Dilution          | 1:2        | VialPrimeVolume            | 2.0 ml     |
| AcidVolume        | 1.0 ml     | ICSamplePrimeVolume        | 2.0 ml     |
| DetectorSweepFlow | 500 ml/min | BaselineStabilizeTime      | 0.70 min   |
| PreSpurge Time    | 0.00 mins  | DetectorPressureFlow       | 300 ml/min |
| SystemFlow        | 200 ml/min | SyringeSpeedWaste          | 10         |
|                   |            | SyringeSpeedAcid           | 7          |
|                   |            | SyringeSpeedReagent        | 7          |
|                   |            | SyringeSpeedDIWater        | 7          |
|                   |            | NDIRPressurization         | 50 psig    |
|                   |            | SyringeSpeedSampleDispense | 5          |
|                   |            | SyringeSpeedSampleAspirate | 4          |
|                   |            | SyringeSpeedUVDispense     | 7          |
|                   |            | SyringeSpeedUVAspirate     | 5          |
|                   |            | SyringeSpeedICDispense     | 7          |
|                   |            | SyringeSpeedICAspirate     | 5          |
|                   |            | NDIRPressureStabilize      | 0.50 min   |
|                   |            | LowLevelFilterNDIR         | Off        |

**Acceptance / Approval****Electronic Signatures**

| Report Version | User Name | Acceptance | Reason | Date |
|----------------|-----------|------------|--------|------|
|----------------|-----------|------------|--------|------|

**Report History**



Report History

| Report Version | User Name         | System Reason      | User Reason        | Date             |
|----------------|-------------------|--------------------|--------------------|------------------|
| 1              | Fusion1 (Fusion1) | Schedule completed | Schedule completed | 2018/11/27 17:49 |

StarLIMS Run: 616542  
Analysis: TIC  
Method: SM 5310 C

CCV: 11-GEN-05-72A 25 ppm LCS: 11-GEN-05-67D 25 ppm

ICAL Date: 11/20/18

ICAL ID: 11-GEN-05-72D

Spike ID: 11-GEN-05-67A 0.25 ml of 1000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

21 % H3PO4: 11-GEN-05-72C

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, N11314F, Marge

FILTER ID: NA

|                          |                         |
|--------------------------|-------------------------|
| Analyzed By: CES         | Date Analyzed: 11/27/18 |
| Reviewed By: [Signature] | Date Reviewed: 11/28/18 |

Original  
Work Request # ( ) K1810527  
Tier: IV  
Date Analyzed: 11/29/18  
Analyst: CES Run # 616903  
Analysis: TIC

### DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

- |     |   |                  |
|-----|---|------------------|
| 1.  | Is the method name and number correct and appropriate?  | <u>yes/no/NA</u> |
| 2.  | Holding times met for all analyses and for all samples?   | <u>yes/no/NA</u> |
| 3.  | Are calculations correct?   | <u>yes/no/NA</u> |
| 4.  | Is the reporting basis correct? (Dry Weight)  | <u>yes/no/NA</u> |
| 5.  | All quality control criteria met?   | <u>yes/no</u>    |
| 6.  | Is the calibration curve correlation coefficient $\geq 0.995$ ?   | <u>yes/no/NA</u> |
| 7.  | MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?  | <u>yes/no/NA</u> |
| 8.  | Are ICVs, CCVs, and CCBs all within acceptance limits?  | <u>yes/no/NA</u> |
| 9.  | Are results for methods blanks all ND?  | <u>yes/no/NA</u> |
| 10. | Are all QC samples within acceptance criteria?<br>(LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)               | <u>yes/no/NA</u> |
| 11. | Are all exceptions explained?   | <u>yes/no/NA</u> |
| 12. | Have all applicable service requests been reviewed?   | <u>yes/no/NA</u> |
| 13. | Are all samples labeled correctly?  | <u>yes/no/NA</u> |
| 14. | Have all instructions on the service request been followed?<br>(e.g. Special MRLs, QC on a specific sample, Form V) | <u>yes/no/NA</u> |
| 15. | Are detection limits and units reported correctly?  | <u>yes/no/NA</u> |
| 16. | Is the unused space on the benchsheet crossed out?  | <u>yes/no/NA</u> |
| 17. | Was analysis turned in by the due date? (n-2) (If not record SR#)   | <u>yes/no/NA</u> |

#### COMMENTS:

Re analyzed past hold

Final Approved by: Fraser Date: 11/30/18  
DQREPORT

## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot: 616903 Method/Testcode: SM 5310 C/TIC

| Lab Code     | Target Analytes         | QC  | Parent Sample | Matrix       | Raw Result            | Sample Amt. | Final Result | Dil | MDL | PQL | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-------------------------|-----|---------------|--------------|-----------------------|-------------|--------------|-----|-----|-----|-------|-------|----------------|-----|------|
| K1810527-002 | Carbon, Total Inorganic | N/A |               | Ground Water | 2.76 mg/L             | 10 ml       | 55 mg/L      | 20  | 20  | 40  |       |       | 11/29/18 19:50 | N   | IV   |
| KQ1817508-01 | Carbon, Total Inorganic | MS  | K1810527-002  | Ground Water | 27.15 mg/L            | 10 ml       | 543 mg/L     | 20  | 20  | 40  | 98    |       | 11/29/18 20:03 | N   | IV   |
| KQ1817508-02 | Carbon, Total Inorganic | DUP | K1810527-002  | Ground Water | 2.83 mg/L             | 10 ml       | 57 mg/L      | 20  | 20  | 40  |       | 3     | 11/29/18 19:50 | N   | IV   |
| KQ1817508-03 | Carbon, Total Inorganic | MB  |               | Ground Water | -0.13 mg/L            | 10 ml       | 2.0 mg/L     | U 1 | 1.0 | 2.0 |       |       | 11/29/18 19:35 | N   | IV   |
| KQ1817508-04 | Carbon, Total Inorganic | LCS |               | Ground Water | 24.28 mg/L            | 10 ml       | 24.3 mg/L    | 1   | 1.0 | 2.0 | 97    |       | 11/29/18 19:43 | N   | IV   |
| KQ1817508-05 | Carbon, Total Inorganic | CCV |               | Ground Water | 24.81 mg/L            | 10 ml       | 24.8 mg/L    | 1   |     |     | 99    |       | 11/29/18 19:21 | N   | IV   |
| KQ1817508-06 | Carbon, Total Inorganic | CCV |               | Ground Water | 24.50 mg/L            | 10 ml       | 24.5 mg/L    | 1   |     |     | 98    |       | 11/29/18 20:23 | N   | IV   |
| KQ1817508-07 | Carbon, Total Inorganic | CCB |               | Ground Water | 8.299999999999997E-05 | 10 ml       | 2.0 mg/L     | U 1 | 1.0 | 2.0 |       |       | 11/29/18 19:28 | N   | IV   |
| KQ1817508-08 | Carbon, Total Inorganic | CCB |               | Ground Water | -0.01 mg/L            | 10 ml       | 2.0 mg/L     | U 1 | 1.0 | 2.0 |       |       | 11/29/18 20:30 | N   | IV   |

11/30/18  
*[Signature]*

CES 11/30/18

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

|       |       |       |       |               |         |        |
|-------|-------|-------|-------|---------------|---------|--------|
| 0.339 | 0.339 | 0.339 | 0.339 | OBSERVATIONS  | 3       | 0.3388 |
| 0.204 |       |       |       | STD Deviation | 0.07350 | BELOW  |
| 0.322 | 0.322 | 0.322 | 0.322 | AVERAGE       | 0.28833 | 0.3222 |
|       |       |       |       | UCL           | 0.36184 | BELOW  |
|       |       |       |       | LCL           | 0.21483 | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       | OBSERVATIONS  | 2       | BELOW  |
|       |       |       |       | STD Deviation | 0.09162 | BELOW  |
|       |       |       |       | AVERAGE       | 0.33050 | BELOW  |
|       |       |       |       | UCL           | 0.42212 | BELOW  |
|       |       |       |       | LCL           | 0.23888 | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       | OBSERVATIONS  | 2       | BELOW  |
|       |       |       |       | STD Deviation | 0.09162 | BELOW  |
|       |       |       |       | AVERAGE       | 0.33050 | BELOW  |
|       |       |       |       | UCL           | 0.42212 | BELOW  |
|       |       |       |       | LCL           | 0.23888 | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       | OBSERVATIONS  | 2       | BELOW  |
|       |       |       |       | STD Deviation | 0.01660 | BELOW  |
|       |       |       |       | AVERAGE       | 0.33050 | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       |               |         | BELOW  |
|       |       |       |       |               |         | BELOW  |

11/30/18





TIC: 616903

**Schedule: 11292018B****Version:** 1**Instrument:** Fusion1**Last Saved by:** Fusion1 (Fusion1)**Last Saved on:** 2018/11/29 17:20 - Thursday

| Position | Sample Type    | Sample ID                  | Method ID (Calibration ID) | Reps | Use   | State |
|----------|----------------|----------------------------|----------------------------|------|-------|-------|
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                      |                            | 1    | True  | Ready |
| D        | Sample         | RB                         | IC 030411 (IC 030411)      | 1    | True  | Ready |
| (Blank)  | Blank          | Reagent/Acid Blank         |                            | 1    | True  | Ready |
| D        | Sample         | RB                         | IC 030411 (IC 030411)      | 1    | True  | Ready |
| A        | Check Standard | [IC] CCV 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| D        | Check Standard | [IC] CCB 030411 [0.0 ppm]  | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 1        | Sample         | MB1                        | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 2        | Check Standard | [IC] LCS 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 3        | Sample         | K1810527-002.04 20x        | IC 030411 (IC 030411)      | 2    | True  | Ready |
| 4        | Sample         | K1810527-002.04 ms 20x     | IC 030411 (IC 030411)      | 1    | True  | Ready |
| 5        | Sample         | RB                         | IC 030411 (IC 030411)      | 2    | True  | Ready |
| A        | Check Standard | [IC] CCV 030411 [25.0 ppm] | IC 030411 (IC 030411)      | 1    | True  | Ready |
| D        | Check Standard | [IC] CCB 030411 [0.0 ppm]  | IC 030411 (IC 030411)      | 1    | True  | Ready |
|          |                |                            |                            |      | False |       |

11/30/18  
Huuuuu

## Fusion Report - 11292018B Thursday, November 29, 2018 05:26 PM

(View - Reps, Unused Reps, Meta-  
Data, Signature, History)  
Printed on 2018/11/30 07:46 -  
Friday

### Report Summary Information

Company Location: Gen Chem Lab  
Schedule Name: 11292018B  
Instrument Name: Fusion1  
Report Version: 1 of 1  
Report Creation by Operators (schedule version): Fusion1 (Fusion1) (v1)  
Comment:

Engine Version: 1.1.5.1  
Firmware Version: 1.2.0696  
Connection: RS232 COM1

### Report Results

11/30/18  
*[Signature]*

Sample Type: Clean

From Schedule Version 1

|       | Pos                | Analysis Type  | Sample ID  |                |                 | Start Time       |
|-------|--------------------|----------------|------------|----------------|-----------------|------------------|
| ◆     | (clean)            |                | Clean      |                |                 | 2018/11/29 17:26 |
|       |                    |                |            |                |                 |                  |
| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time         |
| 1     | IC Clean           | 15.83          | 18.62      | 2.80           | 49.33           | 05:28            |
|       |                    |                |            |                |                 |                  |
| 2     | TC Clean           | 5.39           | 8.08       | 2.69           | 49.99           | 04:06            |
| 3     | TC Clean           | 2.06           | 4.74       | 2.68           | 50.03           | 03:49            |
| 4     | TC Clean           | 2.69           | 5.43       | 2.74           | 50.01           | 03:47            |

Sample Type: Clean

From Schedule Version 1

|       | Pos                | Analysis Type  | Sample ID  |                |                 | Start Time       |
|-------|--------------------|----------------|------------|----------------|-----------------|------------------|
| ◆     | (clean)            |                | Clean      |                |                 | 2018/11/29 17:48 |
|       |                    |                |            |                |                 |                  |
| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time         |
| 1     | IC Clean           | 1.05           | 3.42       | 2.37           | 49.28           | 05:19            |
|       |                    |                |            |                |                 |                  |
| 2     | TC Clean           | 5.19           | 7.86       | 2.67           | 50.02           | 04:05            |
| 3     | TC Clean           | 2.76           | 5.59       | 2.83           | 50.09           | 03:47            |
| 4     | TC Clean           | 2.42           | 5.36       | 2.94           | 50.03           | 03:49            |



## Sample Type: Clean

From Schedule Version 1

|       | Pos                | Analysis Type  | Sample ID  |                | Start Time       |          |
|-------|--------------------|----------------|------------|----------------|------------------|----------|
| ◆     | (clean)            |                | Clean      |                | 2018/11/29 18:10 |          |
| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | IC Clean           | 0.86           | 3.57       | 2.71           | 49.28            | 05:19    |
| 2     | TC Clean           | 6.75           | 9.73       | 2.98           | 49.97            | 04:02    |
| 3     | TC Clean           | 4.32           | 7.17       | 2.85           | 50.12            | 03:51    |
| 4     | TC Clean           | 3.86           | 6.71       | 2.84           | 50.04            | 03:57    |

## Sample Type: Sample

From Schedule Version 1

| Pos   | Analysis Type      | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD        | Start Time       |          |
|-------|--------------------|-----------|---------------|------------------|------------|------------------|----------|
| * D   | IC                 | RB        | 0.2020 ppm    | 0.0000 ppm       | 0.0000%    | 2018/11/29 18:32 |          |
| Rep # | Base Analysis Type | ppm       | µg            | Adjusted (Abs)   | NDIR (Abs) | Baseline (Abs)   | Run Time |
| 1     | IC                 | 0.2020    | 0.8081        | 4.66             | 7.67       | 3.00             | 05:02    |

Dilution

1:2

Blank Contribution

(TC) 1.6884 (IC)

(v1192)

Method

IC 030411 (v3)

Calibration

IC 030411 (v13)

## Sample Type: Blank (Creating v1193)

From Schedule Version 1

|   | Pos     | Analysis Type      | Sample ID          |            |                | Start Time       |          |
|---|---------|--------------------|--------------------|------------|----------------|------------------|----------|
| ⊛ | (blank) |                    | Reagent/Acid Blank |            |                | 2018/11/29 18:40 |          |
|   | Rep #   | Base Analysis Type | Adjusted (Abs)     | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
|   | 1       | IC Clean           | 15.13              | 17.96      | 2.83           | 49.32            | 05:25    |
|   |         |                    |                    |            |                |                  |          |
|   | 2       | TC Clean           | 6.81               | 9.67       | 2.86           | 50.03            | 04:05    |
|   | 3       | TC Clean           | 2.13               | 5.12       | 2.99           | 50.03            | 03:48    |
|   | 4       | TC Clean           | 2.01               | 4.89       | 2.88           | 50.01            | 03:45    |
|   |         |                    |                    |            |                |                  |          |
|   | 5       | Reagent Blank      | 4.25               | 6.99       | 2.74           | 50.03            | 05:04    |
|   |         |                    |                    |            |                |                  |          |
|   | 6       | Acid Blank         | 0.88               | 3.59       | 2.71           | 49.30            | 05:34    |

## Sample Type: Sample

From Schedule Version 1

about:blank

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11/30/2018

00954701

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ♦   | D             | IC        | RB            | 0.1990 ppm       | 0.0000% | 2018/11/29 19:13 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.1990 | 0.7959 | 4.54           | 7.95       | 3.42           | 48.96           | 04:56    |

Dilution 1:2  
Blank Contribution (TC) 1.6084 (IC) (v1193)  
Method IC 030411 (v3)  
Calibration IC 030411 (v13)

**Sample Type:** Check Standard --> CCV 030411

From Schedule Version 1

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|------------------------|--------------------|------------|-----|------------------|
| ♦   | A   | IC                  | 1:1 | [IC] CCV 030411 [25.0 ppm] | 0 / infinity (NA / NA) | 25.1387 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/29 19:21 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|----------|----------|----------|
| A   | IC                 | 25.0 ppm | 1     | 25.1387 | 100.5548 | 372.22   | 375.42 | 3.21     | 49.08    | 04:57    |

Completion State Success - Criteria met.  
Success Action Do Nothing  
Method IC 030411 (v3)  
Calibration IC 030411 (v13)  
STD Conc - Pos A 25 ppmC

**Sample Type:** Check Standard --> CCB 030411

From Schedule Version 1

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|-------------------|------------|-----|------------------|
| ♦   | D   | IC                  | DI  | [IC] CCB 030411 [0.0 ppm] | 0 / infinity (NA / NA) | 0.3388 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/29 19:28 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
| D   | IC                 | 0.0 ppm | 1     | 0.3388 | 1.3553 | 7.32     | 10.54 | 3.23     | 49.07    | 04:36    |

Completion State Success - Criteria met.  
Success Action Do Nothing  
Method IC 030411 (v3)  
Calibration IC 030411 (v13)  
STD Conc - Pos D 0 ppmC

**Sample Type:** Sample

From Schedule Version 1

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ♦   | 1             | IC        | MB1           | 0.2040 ppm       | 0.0000% | 2018/11/29 19:35 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.2040 | 0.8160 | 4.61           | 8.04       | 3.43           | 49.02           | 04:54    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.6084 (IC)  
(v1193)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

Sample Type: Check Standard --&gt; LCS 030411

From Schedule Version 1

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|------------------------|--------------------|------------|-----|------------------|
| ◆   | 2   | IC                  | 1:1 | [IC] LCS 030411 [25.0 ppm] | 0 / infinity (NA / NA) | 24.6153 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/29 19:43 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg      | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|---------|----------|--------|----------|----------|----------|
| 2   | IC                 | 25.0 ppm | 1     | 24.6153 | 98.4613 | 364.51   | 367.86 | 3.35     | 49.02    | 04:58    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

**STD Conc - Pos 2**  
25 ppmC

Sample Type: Sample

From Schedule Version 1

| Pos | Analysis Type | Sample ID | Result (ppmC)       | Std. Dev. (ppmC) | RSD                | Start Time       |
|-----|---------------|-----------|---------------------|------------------|--------------------|------------------|
| ◆   | 3             | IC        | K1810527-002.04 20x | 3.1290 ppm       | 0.0504 ppm 1.6100% | 2018/11/29 19:50 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 3.0934 | 12.3737 | 47.12          | 50.40      | 3.28           | 49.05           | 04:55    |
| 2     | IC                 | 3.1646 | 12.6586 | 48.17          | 51.04      | 2.87           | 49.01           | 04:56    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.6084 (IC)  
(v1193)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID | Result (ppmC)          | Std. Dev. (ppmC) | RSD                | Start Time       |
|-----|---------------|-----------|------------------------|------------------|--------------------|------------------|
| ◆   | 4             | IC        | K1810527-002.04 ms 20x | 27.4817 ppm      | 0.0000 ppm 0.0000% | 2018/11/29 20:03 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 27.4817 | 109.9269 | 405.97         | 409.25     | 3.28           | 49.02           | 04:56    |

**Dilution**  
1:2

**Blank Contribution**  
(TC) 1.6084 (IC)  
(v1193)

**Method**  
IC 030411 (v3)

**Calibration**  
IC 030411 (v13)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD                | Start Time       |
|-----|---------------|-----------|---------------|------------------|--------------------|------------------|
| ◆   | 5             | IC        | RB            | 0.3380 ppm       | 0.0033 ppm 0.9700% | 2018/11/29 20:10 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | IC                 | 0.3357 | 1.3429 | 6.55           | 9.85       | 3.30           | 49.07           | 04:59    |
| 2     | IC                 | 0.3403 | 1.3614 | 6.62           | 9.38       | 2.76           | 49.00           | 04:56    |

|                 |                             |                |                    |
|-----------------|-----------------------------|----------------|--------------------|
| <u>Dilution</u> | <u>Blank Contribution</u>   | <u>Method</u>  | <u>Calibration</u> |
| 1:2             | (TC) 1.6084 (IC)<br>(v1193) | IC 030411 (v3) | IC 030411 (v13)    |

Sample Type: Check Standard --&gt; CCV 030411

From Schedule Version 1

| Pos | BAT | Concentration<br>(ppm) | Dil     | Sample ID                         | Min / Max<br>(% dev)      | Result                   | Std. Dev.     | RSD | Start Time       |
|-----|-----|------------------------|---------|-----------------------------------|---------------------------|--------------------------|---------------|-----|------------------|
| ♦   | A   | IC                     | 25.0000 | 1:1 [IC] CCV 030411<br>[25.0 ppm] | 0 / infinity<br>(NA / NA) | 24.8266<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%  | 2018/11/29 20:23 |

| Pos | Base<br>Analysis<br>Type | ID       | Rep<br># | ppm     | µg      | Adjusted | NDIR   | Baseline | Pressure | Run<br>Time |
|-----|--------------------------|----------|----------|---------|---------|----------|--------|----------|----------|-------------|
| A   | IC                       | 25.0 ppm | 1        | 24.8266 | 99.3065 | 367.62   | 371.09 | 3.47     | 49.07    | 04:58       |

|                         |                       |                |                    |                         |
|-------------------------|-----------------------|----------------|--------------------|-------------------------|
| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>  | <u>Calibration</u> | <u>STD Conc - Pos A</u> |
| Success - Criteria met. | Do Nothing            | IC 030411 (v3) | IC 030411 (v13)    | 25 ppmC                 |

Sample Type: Check Standard --&gt; CCB 030411

From Schedule Version 1

| Pos | BAT | Concentration<br>(ppm) | Dil          | Sample ID                       | Min / Max<br>(% dev)      | Result                  | Std. Dev.     | RSD | Start Time       |
|-----|-----|------------------------|--------------|---------------------------------|---------------------------|-------------------------|---------------|-----|------------------|
| ♦   | D   | IC                     | DI Water [0] | DI [IC] CCB 030411<br>[0.0 ppm] | 0 / infinity<br>(NA / NA) | 0.3222<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%  | 2018/11/29 20:30 |

| Pos | Base<br>Analysis<br>Type | ID      | Rep<br># | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run<br>Time |
|-----|--------------------------|---------|----------|--------|--------|----------|-------|----------|----------|-------------|
| D   | IC                       | 0.0 ppm | 1        | 0.3222 | 1.2887 | 7.07     | 10.36 | 3.29     | 49.04    | 04:38       |

|                         |                       |                |                    |                         |
|-------------------------|-----------------------|----------------|--------------------|-------------------------|
| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>  | <u>Calibration</u> | <u>STD Conc - Pos D</u> |
| Success - Criteria met. | Do Nothing            | IC 030411 (v3) | IC 030411 (v13)    | 0 ppmC                  |

### Meta Data Used in this Report

#### Blanks

| Version | Reagent<br>(Abs) | Acid<br>(Abs) | DI IC<br>(Abs) | DI TC<br>(Abs) | DI TOC<br>(Abs) | Save Time        | Operator          |
|---------|------------------|---------------|----------------|----------------|-----------------|------------------|-------------------|
| v1192   | 1.6810           | 1.0450        | 0.0000         | 0.0000         | 0.0000          | 2018/11/27 21:11 | Fusion1 (Fusion1) |
| v1193   | 1.4157           | 0.8850        | 0.0000         | 0.0000         | 0.0000          | 2018/11/29 19:13 | Fusion1 (Fusion1) |

#### Calibrations

about:blank

103 of 160

11/30/2018

00954704

**Name: IC 030411 (IC)**

Version: v13 Calibration curve IC:  $y = 14.714x + 2.332$   
formula:  
Ver Creation: 2018/11/20 15:25  $r^2$  value: IC:  $r^2 = 0.99968$

**Comment:**

Operator: Fusion1 (Fusion1-

Basic Analysis IC  
Type**Basic Analysis Type: IC**

| Sample ID | Y Raw Value | X Expected | Message | End Time         |
|-----------|-------------|------------|---------|------------------|
| 0.0 ppm   | 4.3260      | 0.0000     |         | 2018/11/20 14:40 |
| 0.50 ppm  | 12.5220     | 0.5000     |         | 2018/11/20 14:47 |
| 1.00 ppm  | 20.0790     | 1.0000     |         | 2018/11/20 14:54 |
| 5.00 ppm  | 74.7040     | 5.0000     |         | 2018/11/20 15:02 |
| 10.0 ppm  | 146.8910    | 10.0000    |         | 2018/11/20 15:09 |
| 25.0 ppm  | 360.9070    | 25.0000    |         | 2018/11/20 15:16 |
| 50.0 ppm  | 743.1960    | 50.0000    |         | 2018/11/20 15:24 |

**Methods****Name: IC 030411 (IC)**

Version: v3 Operator: Gen Chem Lab (Fusion1)  
Ver Creation: 2013/02/04 11:47  
Comment:

| Parameter         | Value      | Advanced Parameter         | Value      |
|-------------------|------------|----------------------------|------------|
| SampleVolume      | 4.0 mL     | NeedleRinseVolume          | 5.0 ml     |
| Dilution          | 1:2        | VialPrimeVolume            | 2.0 ml     |
| AcidVolume        | 1.0 ml     | ICSamplePrimeVolume        | 2.0 ml     |
| DetectorSweepFlow | 500 ml/min | BaselineStabilizeTime      | 0.70 min   |
| PreSpargeTime     | 0.00 mins  | DetectorPressureFlow       | 300 ml/min |
| SystemFlow        | 200 ml/min | SyringeSpeedWaste          | 10         |
|                   |            | SyringeSpeedAcid           | 7          |
|                   |            | SyringeSpeedReagent        | 7          |
|                   |            | SyringeSpeedDIWater        | 7          |
|                   |            | NDIRPressurization         | 50 psig    |
|                   |            | SyringeSpeedSampleDispense | 5          |
|                   |            | SyringeSpeedSampleAspirate | 4          |
|                   |            | SyringeSpeedUVDispense     | 7          |
|                   |            | SyringeSpeedUVAspirate     | 5          |
|                   |            | SyringeSpeedICDispense     | 7          |
|                   |            | SyringeSpeedICAspirate     | 5          |
|                   |            | NDIRPressureStabilize      | 0.50 min   |
|                   |            | LowLevelFilterNDIR         | Off        |

Acceptance / Approval

Electronic Signatures

| Report Version | User Name | Acceptance | Reason | Date |
|----------------|-----------|------------|--------|------|
|----------------|-----------|------------|--------|------|

Report History

Report History

| Report Version | User Name         | System Reason      | User Reason        | Date             |
|----------------|-------------------|--------------------|--------------------|------------------|
| 1              | Fusion1 (Fusion1) | Schedule completed | Schedule completed | 2018/11/29 20:38 |

StarLIMS Run: 616903  
Analysis: TIC  
Method: SM 5310 C

CCV: 11-GEN-05-72A 25 ppm LCS: 11-GEN-05-73B 25 ppm

ICAL Date: 11/20/18

ICAL ID: 11-GEN-05-72D

Spike ID: 11-GEN-05-67A 0.25 ml of 1000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

21 % H3PO4: 11-GEN-05-73A

Equipment ID: K-TOC-03

PIPETTE ID: N11314F, Marge

FILTER ID: NA

|                    |                         |
|--------------------|-------------------------|
| Analyzed By: CES   | Date Analyzed: 11/29/18 |
| Reviewed By: Hough | Date Reviewed:          |



Original  
 Work Request # ( ) K1810165, 0356, 0308, 0413, 0576, 0821, 0340, 0382, 0494,  
 Tier: IV II II II II IV IV IV IV  
 Date Analyzed: 11/12/18 0527, 0977, 0334, 0387  
 Analyst: CES Run # TOC: 614837,  
 Analysis: TOC/DOC 614838  
DOC: 614839

### DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1. Is the method name and number correct and appropriate? yes/no/NA
2. Holding times met for all analyses and for all samples? yes/no/NA
3. Are calculations correct? yes/no/NA
4. Is the reporting basis correct? (Dry Weight) yes/no/NA
5. All quality control criteria met? yes/no
6. Is the calibration curve correlation coefficient  $\geq 0.995$ ? yes/no/NA
7. MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency? yes/no/NA
8. Are ICVs, CCVs, and CCBs all within acceptance limits? yes/no/NA
9. Are results for methods blanks all ND? yes/no/NA
10. Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.) yes/no/NA
11. Are all exceptions explained? yes/no/NA
12. Have all applicable service requests been reviewed? yes/no/NA
13. Are all samples labeled correctly? yes/no/NA
14. Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V) yes/no/NA
15. Are detection limits and units reported correctly? yes/no/NA
16. Is the unused space on the benchsheet crossed out? yes/no/NA
17. Was analysis turned in by the due date? (n-2) (If not record SR#) yes/no/NA

#### COMMENTS:

0382-3, 0308-2, 0494-2 → 7 RPD is not within acceptance limits.  
The sample results are less than 5x the MRL.  
0334-3 RPD not within acceptance limits - foamy non homogeneous sample.  
RA 0340-3, 5, 6, 0527-3 - RPD; RA 0340-1, 0413-4 - carry over.  
RA 0387-3 over diluted.

Final Approved by: [Signature] Date: 11/16/18

DQREPORT



## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot: 614837 Method/Testcode: SM 5310 C/TOC T

| Lab Code     | Target Analytes       | QC   | Parent Sample | Matrix       | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-----------------------|------|---------------|--------------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| 1810165-006  | Carbon, Total Organic | N/A  |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/12/18 22:56 | N   | IV   |
| 1810308-002  | Carbon, Total Organic | N/A  |               | Water        | 2.49 mg/L  | 10 ml       | 2.49 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 02:07 | N   | II   |
| 1810340-001  | Carbon, Total Organic | N/A  |               | Water        | 4.64 mg/L  | 10 ml       | 93 mg/L      | 20  | 2    | 10   |       |       | 11/13/18 09:03 | N   | IV   |
| 1810340-002  | Carbon, Total Organic | N/A  |               | Water        | 17.22 mg/L | 10 ml       | 17.2 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 10:23 | N   | IV   |
| 1810340-003  | Carbon, Total Organic | N/A  |               | Water        | 1.23 mg/L  | 10 ml       | 61 mg/L      | 50  | 4    | 25   |       |       | 11/13/18 11:28 | N   | IV   |
| 1810340-004  | Carbon, Total Organic | N/A  |               | Water        | 4.11 mg/L  | 10 ml       | 41.1 mg/L    | 10  | 0.7  | 5.0  |       |       | 11/13/18 12:31 | N   | IV   |
| 1810340-005  | Carbon, Total Organic | N/A  |               | Water        | 1.04 mg/L  | 10 ml       | 21 mg/L      | 20  | 2    | 10   |       |       | 11/13/18 13:35 | N   | IV   |
| 1810340-006  | Carbon, Total Organic | N/A  |               | Water        | 1.23 mg/L  | 10 ml       | 12.3 mg/L    | 10  | 0.7  | 5.0  |       |       | 11/13/18 14:38 | N   | IV   |
| 1810356-001  | Carbon, Total Organic | N/A  |               | Water        | 20.46 mg/L | 10 ml       | 20.5 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 00:32 | N   | II   |
| 1810382-001  | Carbon, Total Organic | N/A  |               | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 15:41 | N   | IV   |
| 1810382-002  | Carbon, Total Organic | N/A  |               | Ground Water | 1.75 mg/L  | 10 ml       | 1.75 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 17:52 | N   | IV   |
| 1810382-003  | Carbon, Total Organic | N/A  |               | Ground Water | 0.39 mg/L  | 10 ml       | 0.39 mg/L J  | 1   | 0.07 | 0.50 |       |       | 11/13/18 18:24 | N   | IV   |
| 1810413-001  | Carbon, Total Organic | N/A  |               | Water        | 3.07 mg/L  | 10 ml       | 3.07 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 02:39 | N   | II   |
| 1810413-002  | Carbon, Total Organic | N/A  |               | Water        | 9.32 mg/L  | 10 ml       | 9.32 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 03:43 | N   | II   |
| 1810413-003  | Carbon, Total Organic | N/A  |               | Water        | 9.13 mg/L  | 10 ml       | 9.13 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 04:15 | N   | II   |
| 1810413-004  | Carbon, Total Organic | N/A  |               | Water        | 3.60 mg/L  | 10 ml       | 3.60 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 04:47 | N   | II   |
| 1810576-007  | Carbon, Total Organic | N/A  |               | Water        | 9.79 mg/L  | 10 ml       | 19.6 mg/L    | 2   | 0.2  | 1.0  |       |       | 11/13/18 05:18 | N   | II   |
| 1810821-001  | Carbon, Total Organic | N/A  |               | Water        | 0.16 mg/L  | 10 ml       | 0.16 mg/L J  | 1   | 0.07 | 0.50 |       |       | 11/13/18 07:28 | N   | IV   |
| KQ1816883-01 | Carbon, Total Organic | MS   | K1810165-006  | Water        | 26.23 mg/L | 10 ml       | 26.2 mg/L    | 1   | 0.07 | 0.50 | 105   |       | 11/12/18 23:28 | N   | IV   |
| KQ1816883-02 | Carbon, Total Organic | DMS  | K1810165-006  | Water        | 25.25 mg/L | 10 ml       | 25.2 mg/L    | 1   | 0.07 | 0.50 | 101   | 4     | 11/12/18 23:28 | N   | IV   |
| KQ1816883-03 | Carbon, Total Organic | DUP  | K1810165-006  | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       | NC    | 11/12/18 22:56 | N   | IV   |
| KQ1816883-04 | Carbon, Total Organic | DUP  | K1810356-001  | Water        | 21.27 mg/L | 10 ml       | 21.3 mg/L    | 1   | 0.07 | 0.50 |       | 4     | 11/13/18 00:32 | N   | II   |
| KQ1816883-05 | Carbon, Total Organic | DUP  | K1810308-002  | Water        | 1.90 mg/L  | 10 ml       | 1.90 mg/L    | 1   | 0.07 | 0.50 |       | 27*   | 11/13/18 02:07 | N   | II   |
| KQ1816883-06 | Carbon, Total Organic | MS   | K1810413-001  | Water        | 30.06 mg/L | 10 ml       | 30.1 mg/L    | 1   | 0.07 | 0.50 | 108   |       | 11/13/18 03:10 | N   | II   |
| KQ1816883-07 | Carbon, Total Organic | DUP  | K1810413-001  | Water        | 3.21 mg/L  | 10 ml       | 3.21 mg/L    | 1   | 0.07 | 0.50 |       | 4     | 11/13/18 02:39 | N   | II   |
| KQ1816883-08 | Carbon, Total Organic | DUP  | K1810413-002  | Water        | 8.91 mg/L  | 10 ml       | 8.91 mg/L    | 1   | 0.07 | 0.50 |       | 5     | 11/13/18 03:43 | N   | II   |
| KQ1816883-09 | Carbon, Total Organic | DUP  | K1810413-003  | Water        | 8.59 mg/L  | 10 ml       | 8.59 mg/L    | 1   | 0.07 | 0.50 |       | 6     | 11/13/18 04:15 | N   | II   |
| KQ1816883-10 | Carbon, Total Organic | DUP  | K1810413-004  | Water        | 3.18 mg/L  | 10 ml       | 3.18 mg/L    | 1   | 0.07 | 0.50 |       | 12*   | 11/13/18 04:47 | N   | II   |
| KQ1816883-11 | Carbon, Total Organic | DUP  | K1810576-007  | Water        | 9.44 mg/L  | 10 ml       | 18.9 mg/L    | 2   | 0.2  | 1.0  |       | 4     | 11/13/18 05:18 | N   | II   |
| KQ1816883-12 | Carbon, Total Organic | MS   | K1810821-001  | Water        | 27.76 mg/L | 10 ml       | 27.8 mg/L    | 1   | 0.07 | 0.50 | 110   |       | 11/13/18 08:30 | N   | IV   |
| KQ1816883-13 | Carbon, Total Organic | DUP  | K1810821-001  | Water        | 0.03 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       | NC    | 11/13/18 07:28 | N   | IV   |
| KQ1816883-14 | Carbon, Total Organic | TRP  | K1810821-001  | Water        | 0.04 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       | NC    | 11/13/18 07:28 | N   | IV   |
| KQ1816883-15 | Carbon, Total Organic | QUAD | K1810821-001  | Water        | 0.10 mg/L  | 10 ml       | 0.1 mg/L J   | 1   | 0.07 | 0.50 |       | NC    | 11/13/18 07:28 | N   | IV   |
| KQ1816883-16 | Carbon, Total Organic | MS   | K1810340-001  | Water        | 35.85 mg/L | 10 ml       | 717 mg/L     | 20  | 2    | 10   | 125*  |       | 11/13/18 09:35 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

11/16/18  
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 CES

11/16/18



## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot:

614837

Method/Testcode: SM 5310 C/TOC T

| Lab Code     | Target Analytes       | QC  | Parent Sample | Matrix       | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-----------------------|-----|---------------|--------------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| KQ1816883-17 | Carbon, Total Organic | DUP | K1810340-001  | Water        | 4.77 mg/L  | 10 ml       | 95 mg/L      | 20  | 2    | 10   |       | 3     | 11/13/18 09:03 | N   | IV   |
| KQ1816883-18 | Carbon, Total Organic | DUP | K1810340-002  | Water        | 16.39 mg/L | 10 ml       | 16.4 mg/L    | 1   | 0.07 | 0.50 |       | 5     | 11/13/18 10:23 | N   | IV   |
| KQ1816883-19 | Carbon, Total Organic | DUP | K1810340-003  | Water        | 1.46 mg/L  | 10 ml       | 73 mg/L      | 50  | 4    | 25   |       | 17*   | 11/13/18 11:28 | N   | IV   |
| KQ1816883-20 | Carbon, Total Organic | DUP | K1810340-004  | Water        | 4.49 mg/L  | 10 ml       | 44.9 mg/L    | 10  | 0.7  | 5.0  |       | 9     | 11/13/18 12:31 | N   | IV   |
| KQ1816883-21 | Carbon, Total Organic | DUP | K1810340-005  | Water        | 0.87 mg/L  | 10 ml       | 17 mg/L      | 20  | 2    | 10   |       | 18*   | 11/13/18 13:35 | N   | IV   |
| KQ1816883-22 | Carbon, Total Organic | DUP | K1810340-006  | Water        | 1.64 mg/L  | 10 ml       | 16.4 mg/L    | 10  | 0.7  | 5.0  |       | 29*   | 11/13/18 14:38 | N   | IV   |
| KQ1816883-23 | Carbon, Total Organic | MS  | K1810382-001  | Ground Water | 27.15 mg/L | 10 ml       | 27.2 mg/L    | 1   | 0.07 | 0.50 | 109   |       | 11/13/18 16:13 | N   | IV   |
| KQ1816883-24 | Carbon, Total Organic | DUP | K1810382-001  | Ground Water | 0.78 mg/L  | 10 ml       | 0.78 mg/L    | 1   | 0.07 | 0.50 |       | NC    | 11/13/18 15:41 | N   | IV   |
| KQ1816883-25 | Carbon, Total Organic | DUP | K1810382-002  | Ground Water | 1.60 mg/L  | 10 ml       | 1.60 mg/L    | 1   | 0.07 | 0.50 |       | 9     | 11/13/18 17:52 | N   | IV   |
| KQ1816883-26 | Carbon, Total Organic | DUP | K1810382-003  | Ground Water | 0.25 mg/L  | 10 ml       | 0.25 mg/L    | J 1 | 0.07 | 0.50 |       | 45*   | 11/13/18 18:24 | N   | IV   |
| KQ1816883-27 | Carbon, Total Organic | MB  |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/12/18 20:31 | N   | IV   |
| KQ1816883-27 | Carbon, Total Organic | MB  |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/12/18 20:31 | N   | IV   |
| KQ1816883-28 | Carbon, Total Organic | MB  |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/13/18 06:23 | N   | IV   |
| KQ1816883-28 | Carbon, Total Organic | MB  |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/13/18 06:23 | N   | IV   |
| KQ1816883-29 | Carbon, Total Organic | LCS |               | Water        | 22.30 mg/L | 10 ml       | 22.3 mg/L    | 1   | 0.07 | 0.50 | 102   |       | 11/12/18 20:47 | N   | IV   |
| KQ1816883-29 | Carbon, Total Organic | LCS |               | Water        | 22.30 mg/L | 10 ml       | 22.3 mg/L    | 1   | 0.07 | 0.50 | 102   |       | 11/12/18 20:47 | N   | IV   |
| KQ1816883-30 | Carbon, Total Organic | LCS |               | Water        | 21.47 mg/L | 10 ml       | 21.5 mg/L    | 1   | 0.07 | 0.50 | 98    |       | 11/13/18 06:39 | N   | IV   |
| KQ1816883-30 | Carbon, Total Organic | LCS |               | Water        | 21.47 mg/L | 10 ml       | 21.5 mg/L    | 1   | 0.07 | 0.50 | 98    |       | 11/13/18 06:39 | N   | IV   |
| KQ1816883-31 | Carbon, Total Organic | CCV |               | Water        | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/12/18 19:57 | N   | IV   |
| KQ1816883-31 | Carbon, Total Organic | CCV |               | Water        | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/12/18 19:57 | N   | IV   |
| KQ1816883-32 | Carbon, Total Organic | CCV |               | Water        | 25.14 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/12/18 23:59 | N   | IV   |
| KQ1816883-32 | Carbon, Total Organic | CCV |               | Water        | 25.14 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/12/18 23:59 | N   | IV   |
| KQ1816883-33 | Carbon, Total Organic | CCV |               | Water        | 25.13 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 05:50 | N   | IV   |
| KQ1816883-33 | Carbon, Total Organic | CCV |               | Water        | 25.13 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 05:50 | N   | IV   |
| KQ1816883-34 | Carbon, Total Organic | CCV |               | Water        | 25.01 mg/L | 10 ml       | 25.0 mg/L    | 1   |      |      | 100   |       | 11/13/18 10:54 | N   | IV   |
| KQ1816883-34 | Carbon, Total Organic | CCV |               | Water        | 25.01 mg/L | 10 ml       | 25.0 mg/L    | 1   |      |      | 100   |       | 11/13/18 10:54 | N   | IV   |
| KQ1816883-35 | Carbon, Total Organic | CCV |               | Water        | 25.07 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 16:30 | N   | IV   |
| KQ1816883-35 | Carbon, Total Organic | CCV |               | Water        | 25.07 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 16:30 | N   | IV   |
| KQ1816883-36 | Carbon, Total Organic | CCV |               | Water        | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/13/18 21:03 | N   | IV   |
| KQ1816883-36 | Carbon, Total Organic | CCV |               | Water        | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/13/18 21:03 | N   | IV   |
| KQ1816883-37 | Carbon, Total Organic | CCB |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/12/18 20:14 | N   | IV   |
| KQ1816883-37 | Carbon, Total Organic | CCB |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/12/18 20:14 | N   | IV   |
| KQ1816883-38 | Carbon, Total Organic | CCB |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/13/18 00:16 | N   | IV   |
| KQ1816883-38 | Carbon, Total Organic | CCB |               | Water        | 0.00 mg/L  | 10 ml       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 11/13/18 00:16 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

# Analytical Results Summary

00954711

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot:

614837

Method/Testcode: 9060/TOC T

| Lab Code     | Target Analytes       | QC  | Parent Sample | Matrix | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-----------------------|-----|---------------|--------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| KQ1816883-39 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 06:06 | N   | IV   |
| KQ1816883-39 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 06:06 | N   | IV   |
| KQ1816883-40 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 11:11 | N   | IV   |
| KQ1816883-40 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 11:11 | N   | IV   |
| KQ1816883-41 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 16:46 | N   | IV   |
| KQ1816883-41 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 16:46 | N   | IV   |
| KQ1816883-42 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 21:20 | N   | IV   |
| KQ1816883-42 | Carbon, Total Organic | CCB |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 21:20 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.



## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot:

614838

Method/Testcode: SM 5310 C/TOC T

| Lab Cod      | Target Analytes             | QC   | Parent Sample | Matrix       | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-----------------------------|------|---------------|--------------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| K1810494-001 | Carbon, Total Organic       | N/A  |               | Water        | 1.01 mg/L  | 10 ml       | 1.01 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 18:55 | N   | IV   |
| K1810494-002 | Carbon, Total Organic       | N/A  |               | Water        | 1.01 mg/L  | 10 ml       | 1.01 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 19:27 | Y   | IV   |
| K1810494-003 | Carbon, Total Organic       | N/A  |               | Water        | 0.95 mg/L  | 10 ml       | 0.95 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 20:32 | N   | IV   |
| K1810494-004 | Carbon, Total Organic       | N/A  |               | Water        | 1.33 mg/L  | 10 ml       | 1.33 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 21:36 | N   | IV   |
| K1810494-005 | Carbon, Total Organic       | N/A  |               | Water        | 0.70 mg/L  | 10 ml       | 0.70 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 22:08 | N   | IV   |
| K1810494-006 | Carbon, Total Organic       | N/A  |               | Water        | 0.84 mg/L  | 10 ml       | 0.84 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 22:40 | N   | IV   |
| K1810494-007 | Carbon, Total Organic       | N/A  |               | Water        | 0.79 mg/L  | 10 ml       | 0.79 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 23:12 | N   | IV   |
| K1810527-001 | Carbon, Total Organic       | N/A  |               | Ground Water | 3.99 mg/L  | 10 ml       | 3.99 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/13/18 23:43 | N   | IV   |
| K1810527-002 | Carbon, Total Organic       | N/A  |               | Ground Water | 2.86 mg/L  | 10 ml       | 2.86 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/14/18 00:47 | N   | IV   |
| K1810527-003 | Carbon, Total Organic       | N/A  |               | Ground Water | 3.19 mg/L  | 10 ml       | 3.19 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/14/18 01:51 | N   | IV   |
| K1810977-001 | Carbon, Total Organic (TOC) | N/A  |               | Water        | 2.82 mg/L  | 10 ml       | 2.82 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/14/18 03:29 | N   | IV   |
| K1810977-002 | Carbon, Total Organic (TOC) | N/A  |               | Water        | 1.23 mg/L  | 10 ml       | 4.9 mg/L     | 4   | 0.3  | 2.0  |       |       | 11/14/18 05:04 | N   | IV   |
| KQ1816886-01 | Carbon, Total Organic       | DUP  | K1810494-001  | Water        | 0.93 mg/L  | 10 ml       | 0.93 mg/L    | 1   | 0.07 | 0.50 |       | 8     | 11/13/18 18:55 | N   | IV   |
| KQ1816886-02 | Carbon, Total Organic       | MS   | K1810494-002  | Water        | 27.83 mg/L | 10 ml       | 27.8 mg/L    | 1   | 0.07 | 0.50 | 107   |       | 11/13/18 19:59 | N   | IV   |
| KQ1816886-03 | Carbon, Total Organic       | DUP  | K1810494-002  | Water        | 0.88 mg/L  | 10 ml       | 0.88 mg/L    | 1   | 0.07 | 0.50 |       | 14*   | 11/13/18 19:27 | N   | IV   |
| KQ1816886-04 | Carbon, Total Organic       | DUP  | K1810494-003  | Water        | 0.85 mg/L  | 10 ml       | 0.85 mg/L    | 1   | 0.07 | 0.50 |       | 11*   | 11/13/18 20:32 | N   | IV   |
| KQ1816886-05 | Carbon, Total Organic       | DUP  | K1810494-004  | Water        | 1.19 mg/L  | 10 ml       | 1.19 mg/L    | 1   | 0.07 | 0.50 |       | 11*   | 11/13/18 21:36 | N   | IV   |
| KQ1816886-06 | Carbon, Total Organic       | DUP  | K1810494-005  | Water        | 0.62 mg/L  | 10 ml       | 0.62 mg/L    | 1   | 0.07 | 0.50 |       | 12*   | 11/13/18 22:08 | N   | IV   |
| KQ1816886-07 | Carbon, Total Organic       | DUP  | K1810494-006  | Water        | 0.65 mg/L  | 10 ml       | 0.65 mg/L    | 1   | 0.07 | 0.50 |       | 26*   | 11/13/18 22:40 | N   | IV   |
| KQ1816886-08 | Carbon, Total Organic       | DUP  | K1810494-007  | Water        | 0.56 mg/L  | 10 ml       | 0.56 mg/L    | 1   | 0.07 | 0.50 |       | 35*   | 11/13/18 23:12 | N   | IV   |
| KQ1816886-09 | Carbon, Total Organic       | MS   | K1810527-001  | Ground Water | 29.14 mg/L | 10 ml       | 29.1 mg/L    | 1   | 0.07 | 0.50 | 101   |       | 11/14/18 00:15 | N   | IV   |
| KQ1816886-10 | Carbon, Total Organic       | DUP  | K1810527-001  | Ground Water | 3.42 mg/L  | 10 ml       | 3.42 mg/L    | 1   | 0.07 | 0.50 |       | 15*   | 11/13/18 23:43 | N   | IV   |
| KQ1816886-11 | Carbon, Total Organic       | DUP  | K1810527-002  | Ground Water | 2.55 mg/L  | 10 ml       | 2.55 mg/L    | 1   | 0.07 | 0.50 |       | 12*   | 11/14/18 00:47 | N   | IV   |
| KQ1816886-12 | Carbon, Total Organic       | DUP  | K1810527-003  | Ground Water | 2.78 mg/L  | 10 ml       | 2.78 mg/L    | 1   | 0.07 | 0.50 |       | 14*   | 11/14/18 01:51 | N   | IV   |
| KQ1816886-13 | Carbon, Total Organic (TOC) | MS   | K1810977-001  | Water        | 29.65 mg/L | 10 ml       | 29.7 mg/L    | 1   | 0.07 | 0.50 | 107   |       | 11/14/18 04:32 | N   | IV   |
| KQ1816886-14 | Carbon, Total Organic (TOC) | DUP  | K1810977-001  | Water        | 2.79 mg/L  | 10 ml       | 2.79 mg/L    | 1   |      | 0.50 |       | <1    | 11/14/18 03:29 | N   | IV   |
| KQ1816886-15 | Carbon, Total Organic (TOC) | TRP  | K1810977-001  | Water        | 2.81 mg/L  | 10 ml       | 2.81 mg/L    | 1   |      | 0.50 |       | <1    | 11/14/18 03:29 | N   | IV   |
| KQ1816886-16 | Carbon, Total Organic (TOC) | QUAD | K1810977-001  | Water        | 3.38 mg/L  | 10 ml       | 3.38 mg/L    | 1   |      | 0.50 |       | 10    | 11/14/18 03:29 | N   | IV   |
| KQ1816886-17 | Carbon, Total Organic (TOC) | DUP  | K1810977-002  | Water        | 1.17 mg/L  | 10 ml       | 4.7 mg/L     | 4   |      | 2.0  |       | 5     | 11/14/18 05:04 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Result 1 of 100

11/16/18  
Thompson

CES 11/16/18



## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot: 614838 Method/Testcode: 9060A/TOC T

| Lab Cod      | Target Analytes             | QC   | Parent Sample | Matrix | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|-----------------------------|------|---------------|--------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| KQ1816886-18 | Carbon, Total Organic (TOC) | TRP  | K1810977-002  | Water  | 1.09 mg/L  | 10 ml       | 4.4 mg/L     | 4   |      | 2.0  |       | 6     | 11/14/18 05:04 | N   | IV   |
| KQ1816886-19 | Carbon, Total Organic (TOC) | QUAD | K1810977-002  | Water  | 1.11 mg/L  | 10 ml       | 4.4 mg/L     | 4   |      | 2.0  |       | 6     | 11/14/18 05:04 | N   | IV   |
| KQ1816886-20 | Carbon, Total Organic       | MB   |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 17:03 | N   | IV   |
| KQ1816886-20 | Carbon, Total Organic (TOC) | MB   |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   |      | 0.50 |       |       | 11/13/18 17:03 | N   | IV   |
| KQ1816886-21 | Carbon, Total Organic       | LCS  |               | Water  | 21.59 mg/L | 10 ml       | 21.6 mg/L    | 1   | 0.07 | 0.50 | 99    |       | 11/13/18 17:19 | N   | IV   |
| KQ1816886-21 | Carbon, Total Organic (TOC) | LCS  |               | Water  | 21.59 mg/L | 10 ml       | 21.6 mg/L    | 1   |      | 0.50 | 99    |       | 11/13/18 17:19 | N   | IV   |
| KQ1816886-22 | Carbon, Total Organic       | CCV  |               | Water  | 25.07 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 16:30 | N   | IV   |
| KQ1816886-22 | Carbon, Total Organic (TOC) | CCV  |               | Water  | 25.07 mg/L | 10 ml       | 25.1 mg/L    | 1   |      |      | 100   |       | 11/13/18 16:30 | N   | IV   |
| KQ1816886-23 | Carbon, Total Organic       | CCV  |               | Water  | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/13/18 21:03 | N   | IV   |
| KQ1816886-23 | Carbon, Total Organic (TOC) | CCV  |               | Water  | 25.54 mg/L | 10 ml       | 25.5 mg/L    | 1   |      |      | 102   |       | 11/13/18 21:03 | N   | IV   |
| KQ1816886-24 | Carbon, Total Organic       | CCV  |               | Water  | 25.19 mg/L | 10 ml       | 25.2 mg/L    | 1   |      |      | 101   |       | 11/14/18 02:23 | N   | IV   |
| KQ1816886-24 | Carbon, Total Organic (TOC) | CCV  |               | Water  | 25.19 mg/L | 10 ml       | 25.2 mg/L    | 1   |      |      | 101   |       | 11/14/18 02:23 | N   | IV   |
| KQ1816886-25 | Carbon, Total Organic       | CCV  |               | Water  | 24.90 mg/L | 10 ml       | 24.9 mg/L    | 1   |      |      | 100   |       | 11/14/18 07:59 | N   | IV   |
| KQ1816886-25 | Carbon, Total Organic (TOC) | CCV  |               | Water  | 24.90 mg/L | 10 ml       | 24.9 mg/L    | 1   |      |      | 100   |       | 11/14/18 07:59 | N   | IV   |
| KQ1816886-26 | Carbon, Total Organic       | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 16:46 | N   | IV   |
| KQ1816886-26 | Carbon, Total Organic (TOC) | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   |      | 0.50 |       |       | 11/13/18 16:46 | N   | IV   |
| KQ1816886-27 | Carbon, Total Organic       | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/13/18 21:20 | N   | IV   |
| KQ1816886-27 | Carbon, Total Organic (TOC) | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   |      | 0.50 |       |       | 11/13/18 21:20 | N   | IV   |
| KQ1816886-28 | Carbon, Total Organic       | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 02:39 | N   | IV   |
| KQ1816886-28 | Carbon, Total Organic (TOC) | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   |      | 0.50 |       |       | 11/14/18 02:39 | N   | IV   |
| KQ1816886-29 | Carbon, Total Organic       | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 08:15 | N   | IV   |
| KQ1816886-29 | Carbon, Total Organic (TOC) | CCB  |               | Water  | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   |      | 0.50 |       |       | 11/14/18 08:15 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: CSETHE

Analysis Lot: 614839 Method/Testcode: SM 5310 C/TOC D

| b Cod        | Target Analytes                 | QC  | Parent Sample | Matrix       | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|---------------------------------|-----|---------------|--------------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| 1810334-002  | Carbon, Dissolved Organic (DOC) | N/A |               | Ground Water | 0.05 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 06:39 | N   | IV   |
| 1810334-003  | Carbon, Dissolved Organic (DOC) | N/A |               | Ground Water | 1.39 mg/L  | 10 ml       | 5.6 mg/L     | 4   | 0.3  | 2.0  |       |       | 11/14/18 07:27 | N   | IV   |
| 1810334-004  | Carbon, Dissolved Organic (DOC) | N/A |               | Ground Water | 4.79 mg/L  | 10 ml       | 4.79 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/14/18 08:32 | N   | IV   |
| K1810334-005 | Carbon, Dissolved Organic (DOC) | N/A |               | Ground Water | 1.96 mg/L  | 10 ml       | 7.9 mg/L     | 4   | 0.3  | 2.0  |       |       | 11/14/18 09:04 | N   | IV   |
| K1810334-006 | Carbon, Dissolved Organic (DOC) | N/A |               | Ground Water | 2.82 mg/L  | 10 ml       | 5.6 mg/L     | 2   | 0.2  | 1.0  |       |       | 11/14/18 09:35 | N   | IV   |
| K1810387-002 | Carbon, Dissolved Organic (DOC) | N/A |               | Water        | 1.38 mg/L  | 10 ml       | 1.38 mg/L    | 1   | 0.07 | 0.50 |       |       | 11/14/18 10:39 | N   | IV   |
| K1810387-003 | Carbon, Dissolved Organic (DOC) | N/A |               | Water        | 0.33 mg/L  | 10 ml       | 1.3 mg/L J   | 4   | 0.3  | 2.0  |       |       | 11/14/18 11:43 | N   | IV   |
| KQ1816898-01 | Carbon, Dissolved Organic (DOC) | MS  | K1810334-002  | Ground Water | 26.75 mg/L | 10 ml       | 26.8 mg/L    | 1   | 0.07 | 0.50 | 107   |       | 11/14/18 07:11 | N   | IV   |
| KQ1816898-02 | Carbon, Dissolved Organic (DOC) | DUP | K1810334-002  | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       | NC    | 11/14/18 06:39 | N   | IV   |
| KQ1816898-03 | Carbon, Dissolved Organic (DOC) | DUP | K1810334-003  | Ground Water | 1.14 mg/L  | 10 ml       | 4.5 mg/L     | 4   | 0.3  | 2.0  |       | 20*   | 11/14/18 07:27 | N   | IV   |
| KQ1816898-04 | Carbon, Dissolved Organic (DOC) | DUP | K1810334-004  | Ground Water | 4.66 mg/L  | 10 ml       | 4.66 mg/L    | 1   | 0.07 | 0.50 |       | 3     | 11/14/18 08:32 | N   | IV   |
| KQ1816898-05 | Carbon, Dissolved Organic (DOC) | DUP | K1810334-005  | Ground Water | 1.81 mg/L  | 10 ml       | 7.2 mg/L     | 4   | 0.3  | 2.0  |       | 8     | 11/14/18 09:04 | N   | IV   |
| KQ1816898-06 | Carbon, Dissolved Organic (DOC) | DUP | K1810334-006  | Ground Water | 2.80 mg/L  | 10 ml       | 5.6 mg/L     | 2   | 0.2  | 1.0  |       | <1    | 11/14/18 09:35 | N   | IV   |
| KQ1816898-07 | Carbon, Dissolved Organic (DOC) | MS  | K1810387-002  | Water        | 28.28 mg/L | 10 ml       | 28.3 mg/L    | 1   | 0.07 | 0.50 | 108   |       | 11/14/18 11:10 | N   | IV   |
| KQ1816898-08 | Carbon, Dissolved Organic (DOC) | DUP | K1810387-002  | Water        | 1.34 mg/L  | 10 ml       | 1.34 mg/L    | 1   | 0.07 | 0.50 |       | 3     | 11/14/18 10:39 | N   | IV   |
| KQ1816898-09 | Carbon, Dissolved Organic (DOC) | DUP | K1810387-003  | Water        | 0.24 mg/L  | 10 ml       | 1.0 mg/L J   | 4   | 0.3  | 2.0  |       | 33*   | 11/14/18 11:43 | N   | IV   |
| KQ1816898-10 | Carbon, Dissolved Organic (DOC) | MB  |               | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 02:56 | N   | IV   |
| KQ1816898-11 | Carbon, Dissolved Organic (DOC) | LCS |               | Ground Water | 21.04 mg/L | 10 ml       | 21.0 mg/L    | 1   | 0.07 | 0.50 | 96    |       | 11/14/18 03:12 | N   | IV   |
| KQ1816898-12 | Carbon, Dissolved Organic (DOC) | CCV |               | Ground Water | 25.19 mg/L | 10 ml       | 25.2 mg/L    | 1   |      |      | 101   |       | 11/14/18 02:23 | N   | IV   |
| KQ1816898-13 | Carbon, Dissolved Organic (DOC) | CCV |               | Ground Water | 24.90 mg/L | 10 ml       | 24.9 mg/L    | 1   |      |      | 100   |       | 11/14/18 07:59 | N   | IV   |
| KQ1816898-14 | Carbon, Dissolved Organic (DOC) | CCV |               | Ground Water | 24.57 mg/L | 10 ml       | 24.6 mg/L    | 1   |      |      | 98    |       | 11/14/18 12:47 | N   | IV   |
| KQ1816898-15 | Carbon, Dissolved Organic (DOC) | CCB |               | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 02:39 | N   | IV   |
| KQ1816898-16 | Carbon, Dissolved Organic (DOC) | CCB |               | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 08:15 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

Printed 11/16/18 13:13

Result 13 of 160

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Hanyu

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11/16/18



Analytical Results Summary

00954715

Instrument Name: K-TOC-03      Analyst: CSETHE      Analysis Lot: 614839      Method/Testcode: SM 5310 C/TOC D

| Lab Code     | Target Analytes                 | QC  | Parent Sample | Matrix       | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed  | QC? | Tier |
|--------------|---------------------------------|-----|---------------|--------------|------------|-------------|--------------|-----|------|------|-------|-------|----------------|-----|------|
| KQ1816898-17 | Carbon, Dissolved Organic (DOC) | CCB |               | Ground Water | 0.00 mg/L  | 10 ml       | 0.50 mg/L U  | 1   | 0.07 | 0.50 |       |       | 11/14/18 13:03 | N   | IV   |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

TOC: 614837,  
614838  
DOC: 614839

**Schedule: 11122018**

Version: 10

Instrument: Fusion1

Last Saved by: Fusion1 (Fusion1)

Last Saved on: 2018/11/12 20:53 - Monday

| Position | Sample Type    | Sample ID                  | Method ID (Calibration ID)                          | Reps |
|----------|----------------|----------------------------|---|------|
| (Clean)  | Clean          | Clean                      |   | 1    |
| (Clean)  | Clean          | Clean                      |   | 1    |
| (Clean)  | Clean          | Clean                      |   | 1    |
| (Blank)  | Blank          | Reagent/Acid Blank         |   | 1    |
| D        | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 1        | Sample         | MB1                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 2        | Check Standard | [TOC] LCS ER [21.9 ppm]    | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 3        | Sample         | ICS                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 4        | Sample         | RB1                        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 5        | Sample         | RB2                        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 6        | Sample         | LOD                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 7        | Sample         | LOQ                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 8        | Sample         | K1810165-006.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 9        | Sample         | K1810165-006.06 ms/msd     | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 10       | Sample         | K1810356-001.01            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 11       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 4    |
| 12       | Sample         | K1810308-002.05            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 13       | Sample         | K1810413-001.04            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 14       | Sample         | K1810413-001.04 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 15       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 16       | Sample         | K1810413-002.03            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 17       | Sample         | K1810413-003.03            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 18       | Sample         | K1810413-004.03            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 19       | Sample         | K1810576-007.11 2x         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 20       | Sample         | MB2                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 2        | Check Standard | [TOC] LCS ER [21.9 ppm]    | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 21       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 22       | Sample         | K1810821-001.04            | Extended Reaction 021711 (Extended Reaction 021711) | 4    |
| 23       | Sample         | K1810821-001.04 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 24       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 25       | Sample         | K1810340-001.01 20x        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 26       | Sample         | K1810340-001.01 ms 20x     | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 27       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 28       | Sample         | K1810340-002.01            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 29       | Sample         | K1810340-003.01 50x        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 30       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 31       | Sample         | K1810340-004.01 10x        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 32       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 33       | Sample         | K1810340-005.01 20x        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 34       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 35       | Sample         | K1810340-006.01 10x        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 36       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 37       | Sample         | K1810382-001.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 38       | Sample         | K1810382-001.06 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |

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11/16/18  
Fusion1



## Schedule: 11122018

| Position | Sample Type    | Sample ID                  | Method ID (Calibration ID)                          | Reps |
|----------|----------------|----------------------------|---|------|
| 39       | Sample         | MB3                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| ~        | Check Standard | [TOC] LCS ER [21.9 ppm]    | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 40       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 41       | Sample         | K1810382-002.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 42       | Sample         | K1810382-003.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 43       | Sample         | K1810494-001.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 44       | Sample         | K1810494-002.07            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 45       | Sample         | K1810494-002.07 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 46       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 47       | Sample         | K1810494-003.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 48       | Sample         | K1810494-004.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 49       | Sample         | K1810494-005.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 50       | Sample         | K1810494-006.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 51       | Sample         | K1810494-007.06            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 52       | Sample         | K1810527-001.01            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 53       | Sample         | K1810527-001.01 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 54       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 55       | Sample         | K1810527-002.03            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 56       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 57       | Sample         | K1810527-003.01            | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 58       | Sample         | MB4                        | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 2        | Check Standard | [TOC] LCS ER [21.9 ppm]    | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 59       | Sample         | K1810977-001.01            | Extended Reaction 021711 (Extended Reaction 021711) | 4    |
| 60       | Sample         | K1810977-001.01 ms         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 61       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 62       | Sample         | K1810977-002.02 4x         | Extended Reaction 021711 (Extended Reaction 021711) | 4    |
| 63       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 64       | Sample         | K1810334-002.02 doc        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 65       | Sample         | K1810334-002.02 ms doc     | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 66       | Sample         | K1810334-003.02 doc 4x     | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| D        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 67       | Sample         | K1810334-004.02 doc        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 68       | Sample         | K1810334-005.04 doc 4x     | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 69       | Sample         | K1810334-006.02 doc 2x     | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 70       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 71       | Sample         | K1810387-002.12 doc        | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 72       | Sample         | K1810387-002.12 ms doc     | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 73       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| 74       | Sample         | K1810387-003.12 doc 4x     | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| 75       | Sample         | RB                         | Extended Reaction 021711 (Extended Reaction 021711) | 2    |
| B        | Check Standard | [TOC] CCV 021711 [25 ppm]  | Extended Reaction 021711 (Extended Reaction 021711) | 1    |
| C        | Check Standard | [TOC] CCB 021711 [0.0 ppm] | Extended Reaction 021711 (Extended Reaction 021711) | 1    |

# Fusion Report - 11122018 Monday, November 12, 2018 05:23 PM

(View - Reps, Unused Reps, Meta-  
Data, Signature, History)  
Printed on 2018/11/14 15:01 -  
Wednesday

## Report Summary Information

|  |   |                   |            |
|--|---|-------------------|------------|
| Company Location:                                | Gen Chem Lab  | Engine Version:   | 1.1.5.1    |
| Schedule Name:                                   | 11122018  | Firmware Version: | 1.2.0696   |
| Instrument Name:                                 | Fusion1   | Connection:       | RS232 COM1 |
| Report Version:                                  | 1 of 1  |                   |            |
| Report Creation by Operators (schedule version): | Fusion1 (Fusion1) (v1)<br>Fusion1 (Fusion1) (v2)<br>Fusion1 (Fusion1) (v4)<br>Fusion1 (Fusion1) (v5)<br>Fusion1 (Fusion1) (v6)<br>Fusion1 (Fusion1) (v8)<br>Fusion1 (Fusion1) (v9)<br>Fusion1 (Fusion1) (v10) |                   |            |

Comment:

*11/15/18*  
*11/16/18*  
*Handwritten signature*

## Report Results

Sample Type: Clean

From Schedule Version 1

|       | Pos                | Analysis Type  | Sample ID  |                |                 | Start Time       |
|-------|--------------------|----------------|------------|----------------|-----------------|------------------|
| ◆     | (clean)            |                | Clean      |                |                 | 2018/11/12 17:23 |
| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time         |
| 1     | IC Clean           | 13.60          | 16.28      | 2.68           | 49.61           | 05:29            |
| 2     | TC Clean           | 24.30          | 27.11      | 2.81           | 49.80           | 07:17            |
| 3     | TC Clean           | 4.47           | 7.06       | 2.58           | 49.83           | 07:02            |
| 4     | TC Clean           | 2.39           | 5.09       | 2.70           | 49.88           | 07:02            |

Sample Type: Clean

From Schedule Version 1

| Pos       |                    | Analysis Type  | Sample ID  |                | Start Time       |          |
|-----------|--------------------|----------------|------------|----------------|------------------|----------|
| ♦ (clean) |                    |                | Clean      |                | 2018/11/12 17:54 |          |
| Rep #     | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1         | IC Clean           | 0.91           | 3.46       | 2.55           | 49.56            | 05:16    |

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|   |          |      |      |      |       |       |
|---|----------|------|------|------|-------|-------|
| 2 | TC Clean | 6.13 | 8.82 | 2.69 | 49.79 | 07:19 |
| 3 | TC Clean | 3.22 | 5.77 | 2.55 | 49.87 | 07:01 |
| 4 | TC Clean | 2.54 | 5.29 | 2.75 | 49.83 | 07:04 |

Sample Type: Clean

From Schedule Version 1

| Pos       | Analysis Type | Sample ID | Start Time       |
|-----------|---------------|-----------|------------------|
| • (clean) |               | Clean     | 2018/11/12 18:26 |

| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|----------------|------------|----------------|-----------------|----------|
| 1     | IC Clean           | 1.00           | 3.39       | 2.39           | 49.53           | 05:23    |
| 2     | TC Clean           | 7.97           | 10.75      | 2.78           | 49.81           | 07:17    |
| 3     | TC Clean           | 3.92           | 6.49       | 2.57           | 49.83           | 07:03    |
| 4     | TC Clean           | 4.17           | 6.85       | 2.68           | 49.86           | 07:01    |

Sample Type: Blank (Creating v1180)

From Schedule Version 2

| Pos       | Analysis Type | Sample ID          | Start Time       |
|-----------|---------------|--------------------|------------------|
| • (blank) |               | Reagent/Acid Blank | 2018/11/12 18:58 |

| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|----------------|------------|----------------|-----------------|----------|
| 1     | IC Clean           | 7.38           | 9.78       | 2.39           | 49.46           | 05:17    |
| 2     | TC Clean           | 7.51           | 10.32      | 2.81           | 49.88           | 07:18    |
| 3     | TC Clean           | 2.55           | 5.34       | 2.79           | 49.93           | 07:02    |
| 4     | TC Clean           | 2.59           | 5.39       | 2.79           | 50.08           | 03:51    |
| 5     | Reagent Blank      | 5.89           | 8.52       | 2.62           | 49.84           | 08:11    |
| 6     | Acid Blank         | 1.30           | 3.78       | 2.48           | 49.49           | 05:30    |

Sample Type: Sample

From Schedule Version 4

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | D   | TOC           | RB        | 1.8846 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 19:41 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.8846 | 18.8462 | 37.50          | 40.76      | 3.26           | 49.96           | 12:35    |

DilutionBlank ContributionMethodCalibration

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1:10 (TC) 24.3905 (IC) Extended Reaction Extended Reaction  
(v1180) 021711 (v3) 021711 (v19)

Sample Type: Check Standard --> CCV 021711

From Schedule Version 5

| Pos | BAT | Concentration (ppm) | Dil     | Sample ID                    | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|---------|------------------------------|--------------------------|--------------------|------------|-----|------------------|
| ◆   | B   | TOC                 | 25.0000 | 1:2 [TOC]CCV 021711 [25 ppm] | 0 / infinity ( NA / NA ) | 25.5440 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/12 19:57 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.5440 | 255.4397 | 204.36   | 207.18 | 2.82     | 49.96    | 12:32    |

Completion State Success - Criteria met.  
Success Action Do Nothing  
Method Extended Reaction 021711 (v3)  
Calibration Extended Reaction 021711 (v19)  
STD Conc - Pos B 50 ppmC

Sample Type: Check Standard --> CCB 021711

From Schedule Version 6

| Pos | BAT | Concentration (ppm) | Dil    | Sample ID                     | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|--------|-------------------------------|--------------------------|-------------------|------------|-----|------------------|
| ◆   | D   | TOC                 | 0.0000 | 1:2 [TOC]CCB 021711 [0.0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/12 20:14 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
| D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 23.38    | 26.12 | 2.74     | 50.02    | 12:33    |

Completion State Success - Criteria met.  
Success Action Do Nothing  
Method Extended Reaction 021711 (v3)  
Calibration Extended Reaction 021711 (v19)  
STD Conc - Pos D 0 ppmC

Sample Type: Sample

From Schedule Version 8

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆   | 1             | TOC       | MB1           | 0.0000 ppm       | 0.0000% | 2018/11/12 20:31 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 21.03          | 23.76      | 2.73           | 49.97           | 12:29    |

Dilution 1:10  
Blank Contribution (TC) 24.3905 (IC) (v1180)  
Method Extended Reaction 021711 (v3)  
Calibration Extended Reaction 021711 (v19)

Sample Type: Check Standard --> LCS ER

From Schedule Version 9

| Pos | BAT | Concentration | Dil | Sample ID | Min / Max | Result | Std. Dev. | RSD | Start Time |
|-----|-----|---------------|-----|-----------|-----------|--------|-----------|-----|------------|
|-----|-----|---------------|-----|-----------|-----------|--------|-----------|-----|------------|

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|   |   |     |         |     |                          |                            |  |                          |               |    |                  |
|---|---|-----|---------|-----|--------------------------|----------------------------|--|--------------------------|---------------|----|------------------|
| ◆ | 2 | TOC | 21.9000 | 1:1 | TOC LCS ER<br>[21.9 ppm] | 0 / infinity<br>(NA / NA ) |  | 22.2977<br>ppm<br>(PASS) | 0.0000<br>ppm | 0% | 2018/11/12 20:47 |
|---|---|-----|---------|-----|--------------------------|----------------------------|--|--------------------------|---------------|----|------------------|

| Pos | Base Analysis Type | ID       | Rep # | µg       | Adjusted | NDIR   | Baseline Pressure | Run Time |
|-----|--------------------|----------|-------|----------|----------|--------|-------------------|----------|
| 2   | TOC                | 21.9 ppm | 1     | 22.2977  | 181.78   | 184.64 | 2.86              | 49.93    |
|     |                    |          |       | 222.9767 |          |        |                   | 12:35    |

| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>                    | <u>Calibration</u>                | <u>STD Conc - Pos 2</u> |
|-------------------------|-----------------------|----------------------------------|-----------------------------------|-------------------------|
| Success - Criteria met. | Do Nothing            | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) | 21.9 ppmC               |

**Sample Type: Sample**

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 3   | TOC           | ICS       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 21:03 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 24.08          | 26.82      | 2.74           | 49.95           | 12:28    |

| <u>Dilution</u> | <u>Blank Contribution</u>    | <u>Method</u>                    | <u>Calibration</u>                |
|-----------------|------------------------------|----------------------------------|-----------------------------------|
| 1:10            | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 4   | TOC           | BR1       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 21:20 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.68          | 23.52      | 2.84           | 50.00           | 12:26    |
| 2     | TOC                | 0.0000 | 0.0000 | 20.81          | 23.68      | 2.87           | 49.96           | 12:27    |

| <u>Dilution</u> | <u>Blank Contribution</u>    | <u>Method</u>                    | <u>Calibration</u>                |
|-----------------|------------------------------|----------------------------------|-----------------------------------|
| 1:10            | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | 5   | TOC           | RB2       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 21:51 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.58          | 23.31      | 2.74           | 49.95           | 12:22    |
| 2     | TOC                | 0.0000 | 0.0000 | 19.89          | 22.68      | 2.79           | 49.97           | 12:22    |

| <u>Dilution</u> | <u>Blank Contribution</u>    | <u>Method</u>                    | <u>Calibration</u>                |
|-----------------|------------------------------|----------------------------------|-----------------------------------|
| 1:10            | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | 6   | TOC           | LOD       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 22:23 |

| Rep #   | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|---|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1   | TOC                | 0.0000 | 0.0000 | 22.06          | 24.91      | 2.84           | 50.02           | 12:34    |
| Dilution 1:10<br>Blank Contribution (TC) 24.3905 (IC) (v1180)<br>Method Extended Reaction 021711 (v3)<br>Calibration Extended Reaction 021711 (v19) |                    |        |        |                |            |                |                 |          |

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | 7   | TOC           | LOQ       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 22:40 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 24.09          | 26.86      | 2.77           | 50.17           | 12:32    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ | 8   | TOC           | K1810165-006.06 | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/12 22:56 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.74          | 22.54      | 2.80           | 50.11           | 12:23    |
| 2     | TOC                | 0.0000 | 0.0000 | 19.56          | 22.32      | 2.75           | 50.16           | 12:28    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

|   | Pos | Analysis Type | Sample ID                 | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|---------------------------|---------------|------------------|---------|------------------|
| ◆ | 9   | TOC           | K1810165-006.06<br>ms/msd | 25.7398 ppm   | 0.6989 ppm       | 2.7200% | 2018/11/12 23:28 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 26.2340 | 262.3404 | 206.89         | 209.78     | 2.89           | 50.19           | 12:27    |
| 2     | TOC                | 25.2456 | 252.4562 | 200.01         | 202.75     | 2.74           | 50.16           | 12:28    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

Sample Type: Check Standard --&gt; CCV 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|--------------------|------------|-----|------------------|
| B   | TOC | 25.0000             | 1.2 | [TOC] CCV 021711 [25 ppm] | 0 / infinity (NA / NA) | 25.1369 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/12 23:59 |

| Pos | Base Analysis Type | ID | Rep # | ppm | µg | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|----|-------|-----|----|----------|------|----------|----------|----------|
|     |                    |    |       |     |    |          |      |          |          |          |

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|   |     |        |   |         |          |        |        |      |       |       |
|---|-----|--------|---|---------|----------|--------|--------|------|-------|-------|
| B | TOC | 25 ppm | 1 | 25.1369 | 251.3687 | 201.53 | 204.44 | 2.91 | 50.17 | 12:30 |
|---|-----|--------|---|---------|----------|--------|--------|------|-------|-------|

| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>                    | <u>Calibration</u>                | <u>STD Conc - Pos B</u> |
|-------------------------|-----------------------|----------------------------------|-----------------------------------|-------------------------|
| Success - Criteria met. | Do Nothing            | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) | 50 ppmC                 |

**Sample Type:** Check Standard --> CCB 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                     | Min / Max (% dev)         | Result           | Std. Dev.     | RSD | Start Time       |
|-----|-----|---------------------|-----|-------------------------------|---------------------------|------------------|---------------|-----|------------------|
| ◆   | D   | TOC                 | 1:2 | [TOC] CCB<br>021711 [0.0 ppm] | 0 / infinity<br>(NA / NA) | 0.0000<br>(PASS) | 0.0000<br>ppm | 0%  | 2018/11/13 00:16 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
| D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 20.93    | 23.61 | 2.67     | 50.23    | 12:31    |

| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>                    | <u>Calibration</u>                | <u>STD Conc - Pos D</u> |
|-------------------------|-----------------------|----------------------------------|-----------------------------------|-------------------------|
| Success - Criteria met. | Do Nothing            | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) | 0 ppmC                  |

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC)   | Std. Dev. (ppmC) | RSD        | Start Time |
|-----|---------------|-----------|-----------------|------------------|------------|------------|
| ◆   | 10            | TOC       | K1810356-001.01 | 20.8612 ppm      | 0.5742 ppm | 2.7500%    |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 20.4552 | 204.5517 | 166.69         | 169.37     | 2.68           | 50.20           | 12:29    |
| 2     | TOC                | 21.2672 | 212.6721 | 172.34         | 174.97     | 2.63           | 50.19           | 12:26    |

| <u>Dilution</u> | <u>Blank Contribution</u>    | <u>Method</u>                    | <u>Calibration</u>                |
|-----------------|------------------------------|----------------------------------|-----------------------------------|
| 1:10            | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆   | 11            | TOC       | RB            | 0.0000 ppm       | 0.0000% | 2018/11/13 01:04 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 23.06          | 26.09      | 3.03           | 50.23           | 12:29    |
| 2     | TOC                | 0.0000 | 0.0000 | 21.55          | 24.52      | 2.97           | 50.17           | 12:26    |
| 3     | TOC                | 0.0000 | 0.0000 | 20.16          | 23.02      | 2.86           | 50.24           | 12:27    |
| 4     | TOC                | 0.0000 | 0.0000 | 19.96          | 22.85      | 2.89           | 50.18           | 12:26    |

| <u>Dilution</u> | <u>Blank Contribution</u>    | <u>Method</u>                    | <u>Calibration</u>                |
|-----------------|------------------------------|----------------------------------|-----------------------------------|
| 1:10            | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID | Result (ppmC)   | Std. Dev. (ppmC) | RSD        | Start Time |
|-----|---------------|-----------|-----------------|------------------|------------|------------|
| ◆   | 12            | TOC       | K1810308-002.05 | 2.1926 ppm       | 0.4203 ppm | 19.1700%   |

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| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.4898 | 24.8981 | 41.71          | 44.62      | 2.91           | 50.19           | 12:27    |
| 2     | TOC                | 1.8954 | 18.9540 | 37.58          | 40.47      | 2.89           | 50.20           | 12:27    |

Dilution  
0

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 13  | TOC           | K1810413-001.04 | 3.1421 ppm    | 0.0973 ppm       | 3.1000% | 2018/11/13 02:39 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 3.0733 | 30.7329 | 45.77          | 48.53      | 2.76           | 50.17           | 12:27    |
| 2     | TOC                | 3.2109 | 32.1085 | 46.73          | 49.71      | 2.98           | 50.25           | 12:27    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| 14  | TOC           | K1810413-001.04 ms | 30.0589 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/13 03:10 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 30.0589 | 300.5892 | 233.50         | 236.49     | 2.99           | 50.20           | 12:32    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 15  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 03:27 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.63          | 22.41      | 2.78           | 50.19           | 12:35    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 16  | TOC           | K1810413-002.03 | 9.1140 ppm    | 0.2937 ppm       | 3.2200% | 2018/11/13 03:43 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 9.3216 | 93.2164 | 89.24          | 92.18      | 2.94           | 50.26           | 12:26    |
| 2     | TOC                | 8.9063 | 89.0635 | 86.35          | 89.23      | 2.88           | 50.19           | 12:24    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

| Analysis | Std. Dev. |
|----------|-----------|
|          |           |

| Pos   | Type               | Sample ID       | Result (ppmC) | (ppmC)         | RSD        | Start Time       |                 |          |
|-------|--------------------|-----------------|---------------|----------------|------------|------------------|-----------------|----------|
| 17    | TOC                | K1810413-003.03 | 8.8575 ppm    | 0.3838 ppm     | 4.3300%    | 2018/11/13 04:15 |                 |          |
| Rep # | Base Analysis Type | ppm             | µg            | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs)   | Pressure (psig) | Run Time |
| 1     | TOC                | 9.1289          | 91.2887       | 87.90          | 90.73      | 2.84             | 50.20           | 12:28    |
| 2     | TOC                | 8.5861          | 85.8607       | 84.12          | 86.99      | 2.87             | 50.24           | 12:2     |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ | 18  | TOC           | K1810413-004.03 | 3.3938 ppm    | 0.2962 ppm       | 8.7300% | 2018/11/13 04:47 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 3.6033 | 36.0329 | 49.46          | 52.41      | 2.95           | 50.21           | 12:23    |
| 2     | TOC                | 3.1844 | 31.8440 | 46.54          | 49.37      | 2.83           | 50.25           | 12:25    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

|   | Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| ◆ | 19  | TOC           | K1810576-007.11 2x | 9.6149 ppm    | 0.2468 ppm       | 2.5700% | 2018/11/13 05:18 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 9.7894 | 97.8940 | 92.49          | 95.48      | 2.99           | 50.23           | 12:28    |
| 2     | TOC                | 9.4404 | 94.4038 | 90.06          | 92.88      | 2.82           | 50.20           | 12:22    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

Sample Type: Check Standard --> CCV 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|--------------------------|------------------------|--------------------|------------|-----|------------------|
| ◆ B | TOC | 25.0000             | 1:2 | [TOC]CCV 021711 [25 ppm] | 0 / infinity (NA / NA) | 25.1280 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 05:50 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.1280 | 251.2796 | 201.47   | 204.31 | 2.84     | 50.24    | 12:33    |

Completion State  
Success - Criteria met.

Success Action  
Do Nothing

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

STD Conc - Pos B  
50 ppmC

Sample Type: Check Standard --> CCB 021711

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| Pos | BAT | Concentration (ppm) | Dil    | Sample ID                      | Min / Max (% dev)      | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|--------|--------------------------------|------------------------|-------------------|------------|-----|------------------|
| ♦   | D   | TOC                 | 0.0000 | 1:2 [TOC] CCB 021711 [0.0 ppm] | 0 / infinity (NA / NA) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 06:06 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDI - | Baseline Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|-------------------|----------|
| D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 19.84    | 22.83 | 2.99              | 50.22    |
|     |                    |         |       |        |        |          |       |                   | 12:29    |

**Completion State** Success - Criteria met.

**Success Action** Do Nothing

**Method** Extended Reaction 021711 (v3)

**Calibration** Extended Reaction 021711 (v19)

**STD Conc - Pos D** 0 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ♦   | 20            | TOC       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 06:23 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.22          | 23.04      | 2.82           | 50.21           | 12:32    |

**Dilution** 1:10

**Blank Contribution** (TC) 24.3905 (IC) (v1180)

**Method** Extended Reaction 021711 (v3)

**Calibration** Extended Reaction 021711 (v19)

**Sample Type:** Check Standard --> LCS ER

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID               | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|-------------------------|------------------------|--------------------|------------|-----|------------------|
| ♦   | 2   | TOC                 | 1:1 | [TOC] LCS ER [21.9 ppm] | 0 / infinity (NA / NA) | 21.4665 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 06:39 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|-------------------|----------|
| 2   | TOC                | 21.9 ppm | 1     | 21.4665 | 214.6652 | 176.00   | 178.98 | 2.99              | 50.26    |
|     |                    |          |       |         |          |          |        |                   | 12:32    |

**Completion State** Success - Criteria met.

**Success Action** Do Nothing

**Method** Extended Reaction 021711 (v3)

**Calibration** Extended Reaction 021711 (v19)

**STD Conc - Pos 2** 21.9 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ♦   | 21            | TOC       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 06:56 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.82          | 22.70      | 2.88           | 50.22           | 12:26    |
|       |                    |        |        |                |            |                |                 |          |



|   |     |        |        |       |       |      |       |       |
|---|-----|--------|--------|-------|-------|------|-------|-------|
| 2 | TOC | 0.0000 | 0.0000 | 19.54 | 22.41 | 2.87 | 50.18 | 12:26 |
|---|-----|--------|--------|-------|-------|------|-------|-------|

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------------|---------------|------------------|----------|------------------|
| 22  | TOC           | K1810821-001.04 | 0.0835 ppm    | 0.0597 ppm       | 71.5000% | 2018/11/13 07:28 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.1618 | 1.6179 | 25.52          | 28.44      | 2.92           | 50.26           | 12:24    |
| 2     | TOC                | 0.0308 | 0.3083 | 24.60          | 27.48      | 2.87           | 50.21           | 12:26    |
| 3     | TOC                | 0.0436 | 0.4362 | 24.69          | 27.66      | 2.97           | 50.23           | 12:26    |
| 4     | TOC                | 0.0978 | 0.9782 | 25.07          | 27.81      | 2.74           | 50.19           | 12:27    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|    |     |                    |             |            |         |                  |
|----|-----|--------------------|-------------|------------|---------|------------------|
| 23 | TOC | K1810821-001.04 ms | 27.7566 ppm | 0.0000 ppm | 0.0000% | 2018/11/13 08:30 |
|----|-----|--------------------|-------------|------------|---------|------------------|

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 27.7566 | 277.5663 | 217.48         | 220.31     | 2.83           | 50.14           | 12:30    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|    |     |    |            |            |         |                  |
|----|-----|----|------------|------------|---------|------------------|
| 24 | TOC | RB | 0.0000 ppm | 0.0000 ppm | 0.0000% | 2018/11/13 08:47 |
|----|-----|----|------------|------------|---------|------------------|

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.87          | 23.80      | 2.92           | 50.20           | 12:32    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|    |     |                     |            |            |         |                  |
|----|-----|---------------------|------------|------------|---------|------------------|
| 25 | TOC | K1810340-001.01 20x | 4.7064 ppm | 0.0921 ppm | 1.9600% | 2018/11/13 09:03 |
|----|-----|---------------------|------------|------------|---------|------------------|

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 4.6413 | 46.4130 | 56.68          | 59.50      | 2.82           | 50.17           | 12:25    |
| 2     | TOC                | 4.7715 | 47.7154 | 57.58          | 60.36      | 2.78           | 50.19           | 12:24    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|  |     |               |           |               |                  |     |            |
|--|-----|---------------|-----------|---------------|------------------|-----|------------|
|  | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD | Start Time |
|--|-----|---------------|-----------|---------------|------------------|-----|------------|

|   |    |     |                           |             |            |         |                  |
|---|----|-----|---------------------------|-------------|------------|---------|------------------|
| ◆ | 26 | TOC | K1810340-001.01 ms<br>20x | 35.8461 ppm | 0.0000 ppm | 0.0000% | 2018/11/13 09:35 |
|---|----|-----|---------------------------|-------------|------------|---------|------------------|

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 35.8461 | 358.4613 | 273.76         | 277.06     | 3.31           | 50.18           | 12:33    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

| Pos  | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|------|---------------|-----------|---------------|------------------|-----------|------------------|
| ◆ 27 | TOC           | RB        | 0.1000 ppm    | 0.1414 ppm       | 141.4200% | 2018/11/13 09:51 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.2000 | 2.0002 | 25.78          | 28.79      | 3.01           | 50.13           | 12:24    |
| 2     | TOC                | 0.0000 | 0.0000 | 21.23          | 23.98      | 2.74           | 50.09           | 12:22    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

| Pos  | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|------|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ 28 | TOC           | K1810340-002.01 | 16.8057 ppm   | 0.5886 ppm       | 3.5000% | 2018/11/13 10:23 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 17.2220 | 172.2196 | 144.20         | 147.03     | 2.84           | 50.12           | 12:23    |
| 2     | TOC                | 16.3895 | 163.8951 | 138.40         | 141.24     | 2.83           | 50.07           | 12:23    |

| Dilution | Blank Contribution        | Method                        | Calibration                    |
|----------|---------------------------|-------------------------------|--------------------------------|
| 1:10     | (TC) 24.3905 (IC) (v1180) | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) |

Sample Type: Check Standard --&gt; CCV 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|--------------------|------------|-----|------------------|
| ◆ B | TOC | 25.0000             | 1:2 | [TOC] CCV 021711 [25 ppm] | 0 / infinity (NA / NA) | 25.0112 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 10:54 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.0112 | 250.1123 | 200.66   | 203.49 | 2.83     | 50.10    | 12:29    |

| Completion State        | Success Action | Method                        | Calibration                    | STD Conc - Pos B |
|-------------------------|----------------|-------------------------------|--------------------------------|------------------|
| Success - Criteria met. | Do Nothing     | Extended Reaction 021711 (v3) | Extended Reaction 021711 (v19) | 50 ppmC          |

Sample Type: Check Standard --&gt; CCB 021711

From Schedule Version 10

| Pos | BAT | Concentration | Dil | Sample ID | Min / Max | Result | Std. Dev. | RSD | Start Time |
|-----|-----|---------------|-----|-----------|-----------|--------|-----------|-----|------------|
|-----|-----|---------------|-----|-----------|-----------|--------|-----------|-----|------------|

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|     |     | (ppm)  |     | (% dev)                      |                         |               |                  |
|-----|-----|--------|-----|------------------------------|-------------------------|---------------|------------------|
| * D | TOC | 0.0000 | 1:2 | [TOC]CCB<br>021711 [0.0 ppm] | 0.0000<br>ppm<br>(PASS) | 0.0000<br>ppm | 2018/11/13 11:11 |

| Pos | Base<br>Analysis<br>Type | ID      | Rep<br># | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run<br>Time |
|-----|--------------------------|---------|----------|--------|--------|----------|-------|----------|----------|-------------|
| D   | TOC                      | 0.0 ppm | 1        | 0.0000 | 0.0000 | 21.55    | 24.53 | 2.98     | 50.08    | 12:29       |

**Completion State**  
 Success - Criteria met.

**Success Action**  
 Do Nothing

**Method**  
 Extended Reaction  
 021711 (v3)

**Calibration**  
 Extended Reaction  
 021711 (v19)

**STD Conc - Pos D**  
 0 ppmC

### Sample Type: Sample

From Schedule Version 10

| Pos  | Analysis<br>Type | Sample ID           | Result (ppmC) | Std. Dev.<br>(ppmC) | RSD      | Start Time       |
|------|------------------|---------------------|---------------|---------------------|----------|------------------|
| * 29 | TOC              | K1810340-003.01 50x | 1.3423 ppm    | 0.1602 ppm          | 11.9300% | 2018/11/13 11:28 |

| Rep<br># | Base<br>Analysis Type | ppm    | µg      | Adjusted<br>(Abs) | NDIR (Abs) | Baseline<br>(Abs) | Pressure<br>(psig) | Run<br>Time |
|----------|-----------------------|--------|---------|-------------------|------------|-------------------|--------------------|-------------|
| 1        | TOC                   | 1.2290 | 12.2898 | 32.94             | 35.86      | 2.92              | 50.08              | 12:28       |
| 2        | TOC                   | 1.4555 | 14.5553 | 34.52             | 37.25      | 2.73              | 50.07              | 12:22       |

**Dilution**  
 1:10

**Blank Contribution**  
 (TC) 24.3905 (IC)  
 (v1180)

**Method**  
 Extended Reaction  
 021711 (v3)

**Calibration**  
 Extended Reaction  
 021711 (v19)

| Pos  | Analysis<br>Type | Sample ID | Result (ppmC) | Std. Dev.<br>(ppmC) | RSD     | Start Time       |
|------|------------------|-----------|---------------|---------------------|---------|------------------|
| * 30 | TOC              | RB        | 0.0000 ppm    | 0.0000 ppm          | 0.0000% | 2018/11/13 11:59 |

| Rep<br># | Base<br>Analysis Type | ppm    | µg     | Adjusted<br>(Abs) | NDIR (Abs) | Baseline<br>(Abs) | Pressure<br>(psig) | Run<br>Time |
|----------|-----------------------|--------|--------|-------------------|------------|-------------------|--------------------|-------------|
| 1        | TOC                   | 0.0000 | 0.0000 | 23.68             | 26.39      | 2.70              | 50.12              | 12:25       |
| 2        | TOC                   | 0.0000 | 0.0000 | 20.51             | 23.47      | 2.96              | 50.15              | 12:24       |

**Dilution**  
 1:10

**Blank Contribution**  
 (TC) 24.3905 (IC)  
 (v1180)

**Method**  
 Extended Reaction  
 021711 (v3)

**Calibration**  
 Extended Reaction  
 021711 (v19)

| Pos  | Analysis<br>Type | Sample ID           | Result (ppmC) | Std. Dev.<br>(ppmC) | RSD     | Start Time       |
|------|------------------|---------------------|---------------|---------------------|---------|------------------|
| * 31 | TOC              | K1810340-004.01 10x | 4.2998 ppm    | 0.2678 ppm          | 6.2300% | 2018/11/13 12:31 |

| Rep<br># | Base<br>Analysis Type | ppm    | µg      | Adjusted<br>(Abs) | NDIR (Abs) | Baseline<br>(Abs) | Pressure<br>(psig) | Run<br>Time |
|----------|-----------------------|--------|---------|-------------------|------------|-------------------|--------------------|-------------|
| 1        | TOC                   | 4.1104 | 41.1044 | 52.98             | 55.76      | 2.78              | 50.18              | 12:29       |
| 2        | TOC                   | 4.4892 | 44.8922 | 55.62             | 58.29      | 2.67              | 50.19              | 12:23       |

**Dilution**  
 1:10

**Blank Contribution**  
 (TC) 24.3905 (IC)  
 (v1180)

**Method**  
 Extended Reaction  
 021711 (v3)

**Calibration**  
 Extended Reaction  
 021711 (v19)

| Pos  | Analysis<br>Type | Sample ID | Result (ppmC) | Std. Dev.<br>(ppmC) | RSD       | Start Time       |
|------|------------------|-----------|---------------|---------------------|-----------|------------------|
| * 32 | TOC              | RB        | 0.0264 ppm    | 0.0374 ppm          | 141.4200% | 2018/11/13 13:03 |

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| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0528 | 0.5282 | 24.76          | 27.65      | 2.89           | 50.19           | 12:30    |
| 2     | TOC                | 0.0000 | 0.0000 | 21.44          | 24.33      | 2.89           | 50.20           | 12:26    |

**Dilution**  
1:10  
**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)  
**Method**  
Extended Reaction  
021711 (v3)  
**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|---------------------|---------------|------------------|----------|------------------|
| 33  | TOC           | K1810340-005.01 20x | 0.9572 ppm    | 0.1213 ppm       | 12.6700% | 2018/11/13 13:35 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.0430 | 10.4297 | 31.65          | 34.56      | 2.92           | 50.22           | 12:24    |
| 2     | TOC                | 0.8715 | 8.7148  | 30.45          | 33.35      | 2.90           | 50.22           | 12:27    |

**Dilution**  
1:10  
**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)  
**Method**  
Extended Reaction  
021711 (v3)  
**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 34  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 14:06 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.34          | 23.16      | 2.82           | 50.21           | 12:25    |
| 2     | TOC                | 0.0000 | 0.0000 | 20.05          | 22.90      | 2.85           | 50.21           | 12:29    |

**Dilution**  
1:10  
**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)  
**Method**  
Extended Reaction  
021711 (v3)  
**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|---------------------|---------------|------------------|----------|------------------|
| 35  | TOC           | K1810340-006.01 10x | 1.4348 ppm    | 0.2940 ppm       | 20.4900% | 2018/11/13 14:38 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.2270 | 12.2697 | 32.93          | 35.67      | 2.74           | 50.21           | 12:26    |
| 2     | TOC                | 1.6427 | 16.4269 | 35.82          | 38.55      | 2.73           | 50.22           | 12:25    |

**Dilution**  
1:10  
**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)  
**Method**  
Extended Reaction  
021711 (v3)  
**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 36  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 15:10 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.63          | 22.54      | 2.91           | 50.25           | 12:25    |
| 2     | TOC                | 0.0000 | 0.0000 | 19.21          | 21.97      | 2.76           | 50.24           | 12:26    |

**Dilution**  
1:10  
**Blank Contribution**  
(TC) 24.3905 (IC)  
**Method**  
Extended Reaction  
**Calibration**  
Extended Reaction

(v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|-----|---------------|-----------------|---------------|------------------|-----------|------------------|
| 37  | TOC           | K1810382-001.06 | 0.3879 ppm    | 0.5485 ppm       | 141.4200% | 2018/11/13 15:41 |

| Re # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1    | TOC                | 0.0000 | 0.0000 | 24.22          | 26.97      | 2.75           | 50.24           | 12:27    |
| 2    | TOC                | 0.7757 | 7.7574 | 29.79          | 32.64      | 2.85           | 50.23           | 12:28    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| 38  | TOC           | K1810382-001.06 ms | 27.1507 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/13 16:13 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 27.1507 | 271.5073 | 213.27         | 216.05     | 2.79           | 50.27           | 12:29    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**Sample Type:** Check Standard --> CCV 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|--------------------------|--------------------|------------|-----|------------------|
| B   | TOC | 25.0000             | 1:2 | [TOC] CCV 021711 [25 ppm] | 0 / infinity ( NA / NA ) | 25.0671 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 16:30 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.0671 | 250.6715 | 201.04   | 203.91 | 2.86     | 50.28    | 12:27    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos B**  
50 ppmC

**Sample Type:** Check Standard --> CCB 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|--------------------------|-------------------|------------|-----|------------------|
| D   | TOC | 0.0000              | 1:2 | [TOC] CCB 021711 [0.0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 16:46 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
| D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 20.33    | 23.10 | 2.77     | 50.31    | 12:30    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos D**  
0 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 39  | TOC           | MB3       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 17:03 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.34          | 22.21      | 2.87           | 50.35           | 12:28    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**Sample Type:** Check Standard --> LCS ER

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)           | Result                | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|-----------------------------|-----------------------|------------|-----|------------------|
| 2   | TOC | 21.9000             | 1:1 | [TOC] LCS ER<br>[21.9 ppm] | 0 / infinity<br>( NA / NA ) | 21.5919 ppm<br>(PASS) | 0.0000 ppm | 0%  | 2018/11/13 17:19 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|----------|----------|----------|
| 2   | TOC                | 21.9 ppm | 1     | 21.5919 | 215.9186 | 176.87   | 179.80 | 2.93     | 50.26    | 12:33    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos 2**  
21.9 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 40  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/13 17:36 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.59          | 23.47      | 2.88           | 50.24           | 12:33    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 41  | TOC           | K1810382-002.06 | 1.6753 ppm    | 0.1087 ppm       | 6.4900% | 2018/11/13 17:52 |

| Rep # | Base Analysis Type | ppm | µg | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|-----|----|----------------|------------|----------------|-----------------|----------|
|       |                    |     |    |                |            |                |                 |          |

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11/14/2018

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|   |     |        |         |       |       |      |       |       |
|---|-----|--------|---------|-------|-------|------|-------|-------|
| 1 | TOC | 1.7521 | 17.5209 | 36.58 | 39.25 | 2.67 | 50.22 | 12:25 |
| 2 | TOC | 1.5984 | 15.9842 | 35.51 | 38.47 | 2.96 | 50.17 | 12:25 |

| <u>Dilution</u> |  | <u>Blank Contribution</u> |  | <u>Method</u>     |                   | <u>Calibration</u> |  |
|-----------------|--|---------------------------|--|-------------------|-------------------|--------------------|--|
| 1:10            |  | (TC) 24.3905 (IC)         |  | Extended Reaction | Extended Reaction |                    |  |
|                 |  | (v1180)                   |  | 021711 (v3)       | 021711 (v19)      |                    |  |

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------------|---------------|------------------|----------|------------------|
| 42  | TOC           | K1810382-003.06 | 0.3220 ppm    | 0.1024 ppm       | 31.7900% | 2018/11/13 18:24 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.3944 | 3.9437 | 27.13          | 30.14      | 3.00           | 50.16           | 12:27    |
| 2     | TOC                | 0.2496 | 2.4962 | 26.13          | 28.84      | 2.71           | 50.20           | 12:23    |

| <u>Dilution</u> |  | <u>Blank Contribution</u> |  | <u>Method</u>     |                   | <u>Calibration</u> |  |
|-----------------|--|---------------------------|--|-------------------|-------------------|--------------------|--|
| 1:10            |  | (TC) 24.3905 (IC)         |  | Extended Reaction | Extended Reaction |                    |  |
|                 |  | (v1180)                   |  | 021711 (v3)       | 021711 (v19)      |                    |  |

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 43  | TOC           | K1810494-001.06 | 0.9702 ppm    | 0.0523 ppm       | 5.4000% | 2018/11/13 18:55 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.0072 | 10.0718 | 31.40          | 34.13      | 2.73           | 50.26           | 12:26    |
| 2     | TOC                | 0.9331 | 9.3315  | 30.88          | 33.84      | 2.96           | 50.24           | 12:25    |

| <u>Dilution</u> |  | <u>Blank Contribution</u> |  | <u>Method</u>     |                   | <u>Calibration</u> |  |
|-----------------|--|---------------------------|--|-------------------|-------------------|--------------------|--|
| 1:10            |  | (TC) 24.3905 (IC)         |  | Extended Reaction | Extended Reaction |                    |  |
|                 |  | (v1180)                   |  | 021711 (v3)       | 021711 (v19)      |                    |  |

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 44  | TOC           | K1810494-002.07 | 0.9421 ppm    | 0.0922 ppm       | 9.7900% | 2018/11/13 19:27 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.0073 | 10.0732 | 31.40          | 34.14      | 2.75           | 50.23           | 12:28    |
| 2     | TOC                | 0.8769 | 8.7694  | 30.49          | 33.31      | 2.82           | 50.23           | 12:25    |

| <u>Dilution</u> |  | <u>Blank Contribution</u> |  | <u>Method</u>     |                   | <u>Calibration</u> |  |
|-----------------|--|---------------------------|--|-------------------|-------------------|--------------------|--|
| 1:10            |  | (TC) 24.3905 (IC)         |  | Extended Reaction | Extended Reaction |                    |  |
|                 |  | (v1180)                   |  | 021711 (v3)       | 021711 (v19)      |                    |  |

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| 45  | TOC           | K1810494-002.07 ms | 27.8264 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/13 19:59 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 27.8264 | 278.2635 | 217.97         | 220.41     | 2.44           | 50.19           | 12:33    |

| <u>Dilution</u> |  | <u>Blank Contribution</u> |  | <u>Method</u>     |                   | <u>Calibration</u> |  |
|-----------------|--|---------------------------|--|-------------------|-------------------|--------------------|--|
| 1:10            |  | (TC) 24.3905 (IC)         |  | Extended Reaction | Extended Reaction |                    |  |
|                 |  | (v1180)                   |  | 021711 (v3)       | 021711 (v19)      |                    |  |

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD | Start Time |
|-----|---------------|-----------|---------------|------------------|-----|------------|
|-----|---------------|-----------|---------------|------------------|-----|------------|

|       |                    |        |        |                |            |                |                  |          |
|-------|--------------------|--------|--------|----------------|------------|----------------|------------------|----------|
| ◆     | 46                 | TOC    | RB     | 0.0000 ppm     | 0.0000 ppm | 0.0000%        | 2018/11/13 20:15 |          |
| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | TOC                | 0.0000 | 0.0000 | 21.95          | 24.73      | 2.78           | 50.17            | 12:32    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ | 47  | TOC           | K1810494-003.06 | 0.9017 ppm    | 0.0714 ppm       | 7.9100% | 2018/11/13 20:32 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.9521 | 9.5212 | 31.01          | 33.74      | 2.73           | 50.16           | 12:26    |
| 2     | TOC                | 0.8512 | 8.5121 | 30.31          | 33.15      | 2.84           | 50.14           | 12:27    |

Dilution  
1:10

Blank Contribution  
(TC) 24.3905 (IC)  
(v1180)

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

Sample Type: Check Standard --&gt; CCV 021711

From Schedule Version 10

|  | Pos | BAT                | Concentration (ppm) | Dil   | Sample ID                 | Min / Max (% dev)        | Result             | Std. Dev.  | RSD      | Start Time       |          |
|--|-----|--------------------|---------------------|-------|---------------------------|--------------------------|--------------------|------------|----------|------------------|----------|
|  | 48  | TOC                | 25.0000             | 1:2   | [TOC] CCV 021711 [25 ppm] | 0 / infinity ( NA / NA ) | 25.5402 ppm (PASS) | 0.0000 ppm | 0%       | 2018/11/13 21:03 |          |
|  | Pos | Base Analysis Type | ID                  | Rep # | ppm                       | µg                       | Adjusted           | NDIR       | Baseline | Pressure         | Run Time |
|  | B   | TOC                | 25 ppm              | 1     | 25.5402                   | 255.4023                 | 204.34             | 207.14     | 2.80     | 50.13            | 12:32    |

Completion State  
Success - Criteria met.

Success Action  
Do Nothing

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

STD Conc - Pos B  
50 ppmC

Sample Type: Check Standard --&gt; CCB 021711

From Schedule Version 10

|  | Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|--|-----|-----|---------------------|-----|----------------------------|--------------------------|-------------------|------------|-----|------------------|
|  | 4   | TOC | 0.0000              | 1:2 | [TOC] CCB 021711 [0.0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2018/11/13 21:20 |

|  | Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|--|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
|  | D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 21.60    | 24.36 | 2.76     | 50.14    | 12:30    |

Completion State  
Success - Criteria met.

Success Action  
Do Nothing

Method  
Extended Reaction  
021711 (v3)

Calibration  
Extended Reaction  
021711 (v19)

STD Conc - Pos D  
0 ppmC

From Schedule Version 10

Sample Type: Sample

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ | 48  | TOC           | K1810494-004.06 | 1.2571 ppm    | 0.0995 ppm       | 7.9200% | 2018/11/13 21:36 |

| Rep # | Base Analysis Type | ppm    | µg      | Absorbance     |            |                | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
|       |                    |        |         | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) |                 |          |
| 1     | TOC                | 1.3274 | 13.2745 | 33.62          | 36.33      | 2.70           | 50.14           | 12:25    |
| 2     | TOC                | 1.1867 | 11.8672 | 32.65          | 35.42      | 2.77           | 50.12           | 12:28    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|       | Pos                | Analysis Type | Sample ID       | Result (ppmC)  | Std. Dev. (ppmC) | RSD            | Start Time       |          |
|-------|--------------------|---------------|-----------------|----------------|------------------|----------------|------------------|----------|
| ◆     | 49                 | TOC           | K1810494-005.06 | 0.6595 ppm     | 0.0582 ppm       | 8.8300%        | 2018/11/13 22:08 |          |
| Rep # | Base Analysis Type | ppm           | µg              | Adjusted (Abs) | NDIR (Abs)       | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | TOC                | 0.7007        | 7.0070          | 29.26          | 32.17            | 2.91           | 50.12            | 12:28    |
| 2     | TOC                | 0.6183        | 6.1833          | 28.69          | 31.57            | 2.88           | 50.10            | 12:24    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------------|---------------|------------------|----------|------------------|
| 50  | TOC           | K1810494-006.06 | 0.7486 ppm    | 0.1352 ppm       | 18.0600% | 2018/11/13 22:40 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.8442 | 8.4416 | 30.26          | 33.01      | 2.75           | 50.13           | 12:29    |
| 2     | TOC                | 0.6530 | 6.5298 | 28.93          | 31.50      | 2.57           | 50.20           | 12:21    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

|       | Pos                | Analysis Type | Sample ID       | Result (ppmC)  | Std. Dev. (ppmC) | RSD            | Start Time       |          |
|-------|--------------------|---------------|-----------------|----------------|------------------|----------------|------------------|----------|
| ◆     | 51                 | TOC           | K1810494-007.06 | 0.6747 ppm     | 0.1661 ppm       | 24.6200%       | 2018/11/13 23:12 |          |
| Rep # | Base Analysis Type | ppm           | µg              | Adjusted (Abs) | NDIR (Abs)       | Baseline (Abs) | Pressure (psig)  | Run Time |
| 1     | TOC                | 0.7921        | 7.9213          | 29.90          | 32.65            | 2.75           | 50.18            | 12:25    |
| 2     | TOC                | 0.5572        | 5.5724          | 28.27          | 31.10            | 2.84           | 50.20            | 12:25    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------------|---------------|------------------|----------|------------------|
| 52  | TOC           | K1810527-001.01 | 3.7069 ppm    | 0.4017 ppm       | 10.8400% | 2018/11/13 23:43 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 3.9910 | 39.9098 | 52.15          | 54.85      | 2.69           | 50.17           | 12:23    |
| 2     | TOC                | 3.4229 | 34.2288 | 48.20          | 51.04      | 2.84           | 50.19           | 12:27    |

Dilution : n  
 Blank Contribution / C) 24.3905 (IC) Extended Reaction Extended React  
 (v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| 53  | TOC           | K1810527-001.01 ms | 29.1418 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/14 00:15 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 29.1418 | 291.4180 | 227.12         | 229.92     | 2.80           | 50.19           | 12:28    |

Dilution 1:10  
 Blank Contribution (TC) 24.3905 (IC) Extended Reaction Extended Reaction  
 (v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 54  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/14 00:31 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 21.40          | 24.26      | 2.86           | 50.16           | 12:29    |

Dilution 1:10  
 Blank Contribution (TC) 24.3905 (IC) Extended Reaction Extended Reaction  
 (v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 55  | TOC           | K1810527-002.03 | 2.7079 ppm    | 0.2207 ppm       | 8.1500% | 2018/11/14 00:47 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.8640 | 28.6399 | 44.31          | 47.12      | 2.81           | 50.17           | 12:26    |
| 2     | TOC                | 2.5519 | 25.5191 | 42.14          | 44.96      | 2.82           | 50.15           | 12:27    |

Dilution 1:10  
 Blank Contribution (TC) 24.3905 (IC) Extended Reaction Extended Reaction  
 (v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|-----|---------------|-----------|---------------|------------------|-----------|------------------|
| 56  | TOC           | RB        | 1.6482 ppm    | 2.3309 ppm       | 141.4200% | 2018/11/14 01:19 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 3.2964 | 32.9638 | 47.32          | 50.35      | 3.03           | 50.13           | 12:26    |
| 2     | TOC                | 0.0000 | 0.0000  | 23.81          | 26.77      | 2.95           | 50.14           | 12:25    |

Dilution 1:10  
 Blank Contribution (TC) 24.3905 (IC) Extended Reaction Extended Reaction  
 (v1180) 021711 (v3) 021711 (v19)

| Analysis | Std. Dev. |
|----------|-----------|
|----------|-----------|

| Pos   | Type               | Sample ID       | Result (ppmC) | (ppmC)         | RSD        | Start Time       |                 |          |
|-------|--------------------|-----------------|---------------|----------------|------------|------------------|-----------------|----------|
| 57    | TOC                | K1810527-003.01 | 2.9837 ppm    | 0.2937 ppm     | 9.8400%    | 2018/11/14 01:51 |                 |          |
| Rep # | Base Analysis Type | ppm             | µg            | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs)   | Pressure (psig) | Run Time |
| 1     | TOC                | 3.1913          | 31.9130       | 46.59          | 49.47      | 2.88             | 50.14           | 12:24    |
|       |                    | 760             | 27.7601       | 43.70          | 46.49      | 2.78             | 50.12           | 12:      |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

Sample Type: Check Standard --&gt; CCV 021711

From Schedule Version 10

|  | Pos | BAT | Concentration (ppm) | Dil     | Sample ID | Min / Max (% dev)            | Result                    | Std. Dev.                | RSD           | Start Time |                  |
|--|-----|-----|---------------------|---------|-----------|------------------------------|---------------------------|--------------------------|---------------|------------|------------------|
|  | ◆   | B   | TOC                 | 25.0000 | 1:2       | [TOC] CCV<br>021711 [25 ppm] | 0 / infinity<br>(NA / NA) | 25.1934<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%         | 2018/11/14 02:23 |

|  | Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|--|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
|  | B   | TOC                | 25 ppm | 1     | 25.1934 | 251.9336 | 201.92   | 204.71 | 2.79     | 50.11    | 12:31    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos B**  
50 ppmC

Sample Type: Check Standard --&gt; CCB 021711

From Schedule Version 10

|  | Pos | BAT | Concentration (ppm) | Dil    | Sample ID | Min / Max (% dev)             | Result                      | Std. Dev.               | RSD           | Start Time |                  |
|--|-----|-----|---------------------|--------|-----------|-------------------------------|-----------------------------|-------------------------|---------------|------------|------------------|
|  | ◆   | D   | TOC                 | 0.0000 | 1:2       | [TOC] CCB<br>021711 [0.0 ppm] | 0 / infinity<br>( NA / NA ) | 0.0000<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%         | 2018/11/14 02:39 |

|  | Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|--|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
|  | D   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 22.44    | 25.32 | 2.88     | 50.11    | 12:31    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos D**  
0 ppmC

Sample Type: Sample

From Schedule Version 10

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ☉ | 58  | TOC           | MB4       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/14 02:56 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 20.20          | 23.08      | 2.88           | 50.12           | 12:32    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

Sample Type: Check Standard -&gt; LCS ER

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                  | Min / Max (% dev)         | Result                   | Std. Dev.     | RSD | Start Time       |
|-----|-----|---------------------|-----|----------------------------|---------------------------|--------------------------|---------------|-----|------------------|
| 2   | TOC | 21.9000             | 1:1 | [TOC] LCS ER<br>[21.9 ppm] | 0 / infinity<br>(NA / NA) | 21.0351<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%  | 2018/11/14 03:12 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|----------|----------|----------|
| 2   | TOC                | 21.9 ppm | 1     | 21.0351 | 210.3512 | 173.00   | 175.84 | 2.85     | 50.14    | 12:32    |

**Completion State**  
Success - Criteria met.

**Success Action**  
Do Nothing

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

**STD Conc - Pos 2**  
21.9 ppmC

Sample Type: Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 59  | TOC           | K1810977-001.01 | 2.9510 ppm    | 0.2858 ppm       | 9.6900% | 2018/11/14 03:29 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.8200 | 28.2000 | 44.01          | 46.95      | 2.94           | 50.15           | 12:28    |
| 2     | TOC                | 2.7933 | 27.9326 | 43.82          | 46.55      | 2.73           | 50.15           | 12:28    |
| 3     | TOC                | 2.8114 | 28.1137 | 43.95          | 46.94      | 3.00           | 50.14           | 12:27    |
| 4     | TOC                | 3.3795 | 33.7947 | 47.90          | 50.70      | 2.80           | 50.14           | 12:28    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| 60  | TOC           | K1810977-001.01 ms | 29.6510 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/14 04:32 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 29.6510 | 296.5096 | 230.66         | 233.56     | 2.90           | 50.16           | 12:30    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 61  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/14 04:48 |

| Rep # | Base Analysis Type | ppm | µg | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|-----|----|----------------|------------|----------------|-----------------|----------|
|       |                    |     |    |                |            |                |                 |          |



|   |     |        |        |       |       |      |       |       |
|---|-----|--------|--------|-------|-------|------|-------|-------|
| 1 | TOC | 0.0000 | 0.0000 | 22.62 | 25.45 | 2.84 | 50.14 | 12:32 |
|---|-----|--------|--------|-------|-------|------|-------|-------|

| Dilution | Blank Contribution           | Method                           | Calibration                       |
|----------|------------------------------|----------------------------------|-----------------------------------|
| 1:10     | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Analysis Type | Sample ID | Result (ppmC)      | Std. Dev. (ppmC) | RSD                | Start Time       |
|---------------|-----------|--------------------|------------------|--------------------|------------------|
| 62            | TOC       | K1810977-002.02 4x | 1.1496 ppm       | 0.0642 ppm 5.5900% | 2018/11/14 05:04 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.2317 | 12.3171 | 32.96          | 35.80      | 2.84           | 50.14           | 12:24    |
| 2     | TOC                | 1.1680 | 11.6803 | 32.52          | 35.31      | 2.80           | 50.13           | 12:25    |
| 3     | TOC                | 1.0885 | 10.8854 | 31.96          | 34.85      | 2.89           | 50.14           | 12:26    |
| 4     | TOC                | 1.1101 | 11.1010 | 32.11          | 34.86      | 2.75           | 50.12           | 12:23    |

| Dilution | Blank Contribution           | Method                           | Calibration                       |
|----------|------------------------------|----------------------------------|-----------------------------------|
| 1:10     | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 63  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/14 06:07 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.35          | 22.11      | 2.75           | 50.13           | 12:27    |
| 2     | TOC                | 0.0000 | 0.0000 | 18.67          | 21.43      | 2.76           | 50.14           | 12:22    |

| Dilution | Blank Contribution           | Method                           | Calibration                       |
|----------|------------------------------|----------------------------------|-----------------------------------|
| 1:10     | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|-----|---------------|---------------------|---------------|------------------|-----------|------------------|
| 64  | TOC           | K1810334-002.02 doc | 0.0258 ppm    | 0.0364 ppm       | 141.4200% | 2018/11/14 06:39 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0515 | 0.5153 | 24.75          | 27.57      | 2.82           | 50.13           | 12:27    |
| 2     | TOC                | 0.0000 | 0.0000 | 24.23          | 27.19      | 2.96           | 50.12           | 12:25    |

| Dilution | Blank Contribution           | Method                           | Calibration                       |
|----------|------------------------------|----------------------------------|-----------------------------------|
| 1:10     | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 65  | TOC           | K1810334-002.02 ms doc | 26.7505 ppm   | 0.0000 ppm       | 0.0000% | 2018/11/14 07:11 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 26.7505 | 267.5053 | 210.48         | 213.33     | 2.85           | 50.13           | 12:29    |

| Dilution | Blank Contribution           | Method                           | Calibration                       |
|----------|------------------------------|----------------------------------|-----------------------------------|
| 1:10     | (TC) 24.3905 (IC)<br>(v1180) | Extended Reaction<br>021711 (v3) | Extended Reaction<br>021711 (v19) |

| Pos  | Analysis Type | Sample ID                 | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|------|---------------|---------------------------|---------------|------------------|----------|------------------|
| ◆ 66 | TOC           | K1810334-003.02 doc<br>4x | 1.2613 ppm    | 0.1787 ppm       | 14.1700% | 2018/11/14 07:27 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.3877 | 13.8768 | 34.04          | 36.98      | 2.94           | 50.12           | 12:2     |
| 2     | TOC                | 1.1350 | 11.3497 | 32.29          | 35.06      | 2.78           | 50.11           | 12:28    |

**Dilution** 1:10  
**Blank Contribution** (TC) 24.3905 (IC) (v1180)  
**Method** Extended Reaction 021711 (v3)  
**Calibration** Extended Reaction 021711 (v19)

**Sample Type:** Check Standard --> CCV 021711

From Schedule Version 10

| Pos | BAT                | Concentration (ppm) | Dil   | Sample ID                | Min / Max (% dev)      | Result             | Std. Dev.  | RSD               | Start Time       |
|-----|--------------------|---------------------|-------|--------------------------|------------------------|--------------------|------------|-------------------|------------------|
| 6   | TOC                | 25.0000             | 1:2   | [TOC]CCV 021711 [25 ppm] | 0 / infinity (NA / NA) | 24.8970 ppm (PASS) | 0.0000 ppm | 0%                | 2018/11/14 07:59 |
| Pos | Base Analysis Type | ID                  | Rep # | ppm                      | µg                     | Adjusted           | NDIR       | Baseline Pressure | Run Time         |
| B   | TOC                | 25 ppm              | 1     | 24.8970                  | 248.9695               | 199.86             | 202.65     | 2.78              | 50.11 12:30      |

**Completion State** Success - Criteria met.  
**Success Action** Do Nothing  
**Method** Extended Reaction 021711 (v3)  
**Calibration** Extended Reaction 021711 (v19)  
**STD Conc - Pos B** 50 ppmC

**Sample Type:** Check Standard --> CCB 021711

From Schedule Version 10

| Pos | BAT                | Concentration (ppm) | Dil   | Sample ID                 | Min / Max (% dev)      | Result            | Std. Dev.  | RSD               | Start Time       |
|-----|--------------------|---------------------|-------|---------------------------|------------------------|-------------------|------------|-------------------|------------------|
| 6   | TOC                | 0.0000              | 1:2   | [TOC]CCB 021711 [0.0 ppm] | 0 / infinity (NA / NA) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%                | 2018/11/14 08:15 |
| Pos | Base Analysis Type | ID                  | Rep # | ppm                       | µg                     | Adjusted          | NDIR       | Baseline Pressure | Run Time         |
| D   | TOC                | 0.0 ppm             | 1     | 0.0000                    | 0.0000                 | 20.21             | 23.01      | 2.80              | 50.12 12:33      |

**Completion State** Success - Criteria met.  
**Success Action** Do Nothing  
**Method** Extended Reaction 021711 (v3)  
**Calibration** Extended Reaction 021711 (v19)  
**STD Conc - Pos D** 0 ppmC

**Sample Type:** Sample

From Schedule Version 10

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 67  | TOC           | K1810334-004.02 doc | 4.7229 ppm    | 0.0956 ppm       | 2.0300% | 2018/11/14 08:32 |

| Rep # | Base Analysis Type | ppm | µg | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|-----|----|----------------|------------|----------------|-----------------|----------|
|-------|--------------------|-----|----|----------------|------------|----------------|-----------------|----------|

|   |     |        |         |       |       |      |       |       |
|---|-----|--------|---------|-------|-------|------|-------|-------|
| 1 | TOC | 4.7905 | 47.9052 | 57.72 | 60.61 | 2.90 | 50.09 | 12:25 |
| 2 | TOC | 4.6552 | 46.5525 | 56.78 | 59.62 | 2.85 | 50.11 | 12:27 |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 68  | TOC           | K1810334-005.04 doc 4x | 1.8869 ppm    | 0.1082 ppm       | 5.7300% | 2018/11/14 09:04 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.9634 | 19.6340 | 38.05          | 41.00      | 2.95           | 50.09           | 12:28    |
| 2     | TOC                | 1.8104 | 18.1045 | 36.98          | 39.86      | 2.87           | 50.13           | 12:25    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 69  | TOC           | K1810334-006.02 doc 2x | 2.8114 ppm    | 0.0109 ppm       | 0.3900% | 2018/11/14 09:35 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.8191 | 28.1914 | 44.00          | 46.78      | 2.78           | 50.12           | 12:23    |
| 2     | TOC                | 2.8038 | 28.0376 | 43.90          | 46.65      | 2.76           | 50.11           | 12:24    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 70  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2018/11/14 10:07 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 18.66          | 21.39      | 2.72           | 50.17           | 12:26    |
| 2     | TOC                | 0.0000 | 0.0000 | 18.44          | 21.24      | 2.80           | 50.16           | 12:27    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 71  | TOC           | K1810387-002.12 doc | 1.3610 ppm    | 0.0294 ppm       | 2.1600% | 2018/11/14 10:39 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.3818 | 13.8179 | 34.00          | 36.80      | 2.79           | 50.17           | 12:28    |
| 2     | TOC                | 1.3402 | 13.4024 | 33.71          | 36.41      | 2.70           | 50.15           | 12:26    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)

**Method**  
Extended Reaction

**Calibration**  
Extended Reaction

(v1180) 021711 (v3) 021711 (v19)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|------------------------|---------------|------------------|----------|------------------|
| 72  | TOC           | K1810387-002.12 ms doc | 28.2797 ppm   | 0.0000 ppm       | 0.00000% | 2018/11/14 11:10 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 28.2797 | 282.7974 | 221.12         | 224.06     | 2.94           | 50.16           | 12:33    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------|---------------|------------------|----------|------------------|
| 73  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.00000% | 2018/11/14 11:27 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 19.56          | 22.43      | 2.87           | 50.19           | 12:35    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|-----|---------------|------------------------|---------------|------------------|-----------|------------------|
| 74  | TOC           | K1810387-003.12 doc 4x | 0.2846 ppm    | 0.0660 ppm       | 23.18000% | 2018/11/14 11:43 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.3313 | 3.3127 | 26.70          | 29.65      | 2.96           | 50.22           | 12:24    |
| 2     | TOC                | 0.2380 | 2.3797 | 26.05          | 28.91      | 2.86           | 50.22           | 12:27    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------|---------------|------------------|----------|------------------|
| 75  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.00000% | 2018/11/14 12:15 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 18.01          | 20.80      | 2.79           | 50.23           | 12:26    |
| 2     | TOC                | 0.0000 | 0.0000 | 18.12          | 20.92      | 2.80           | 50.25           | 12:26    |

**Dilution**  
1:10

**Blank Contribution**  
(TC) 24.3905 (IC)  
(v1180)

**Method**  
Extended Reaction  
021711 (v3)

**Calibration**  
Extended Reaction  
021711 (v19)

Sample Type: Check Standard --&gt; CCV 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil | Sample ID | Min / Max (% dev) | Result | Std. Dev. | RSD | Start Time |
|-----|-----|---------------------|-----|-----------|-------------------|--------|-----------|-----|------------|
|     |     |                     |     |           |                   |        |           |     |            |

about:blank

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11/14/2018

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|   |                          |        |          |         |                             |                           |                          |               |          |                  |
|---|--------------------------|--------|----------|---------|-----------------------------|---------------------------|--------------------------|---------------|----------|------------------|
| ♦ | B                        | TOC    | 25.0000  | 1:2     | [TOC]CCV<br>021711 [25 ppm] | 0 / infinity<br>(NA / NA) | 24.5715<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%       | 2018/11/14 12:47 |
|   | Base<br>Analysis<br>Type | ID     | Rep<br># | ppm     | µg                          | Adjusted                  | NDIR                     | Baseline      | Pressure | Run<br>Time      |
| - | TOC                      | 25 ppm | 1        | 24.5715 | 245.7150                    | 197.60                    | 200.29                   | 2.69          | 50.25    | 12:2-            |

**Completion State**      **Success Action**      **Method**      **Calibration**      **STD Conc - Pos B**  
 Success - Criteria      Do Nothing      Extended Reaction      Extended Reaction      50 ppmC  
 met.      021711 (v3)

Sample Type: Check Standard --&gt; CCB 021711

From Schedule Version 10

| Pos | BAT | Concentration (ppm) | Dil    | Sample ID | Min / Max (% dev)             | Result                  | Std. Dev.     | RSD | Start Time       |
|-----|-----|---------------------|--------|-----------|-------------------------------|-------------------------|---------------|-----|------------------|
| ♦   | C   | TOC                 | 0.0000 | 1:2       | [TOC] CCB<br>021711 [0.0 ppm] | 0.0000<br>ppm<br>(PASS) | 0.0000<br>ppm | 0%  | 2018/11/14 13:03 |

| Pos | Base Analysis Type | ID      | Rep # | ppm    | µg     | Adjusted | NDIR  | Baseline | Pressure | Run Time |
|-----|--------------------|---------|-------|--------|--------|----------|-------|----------|----------|----------|
| C   | TOC                | 0.0 ppm | 1     | 0.0000 | 0.0000 | 20.73    | 23.51 | 2.78     | 50.28    | 12:30    |

**Completion State**      **Success Action**      **Method**      **Calibration**      **STD Conc - Pos C**  
 Success - Criteria      Do Nothing      Extended Reaction      Extended Reaction      0 ppmC  
 met.      021711 (v3)

### Meta Data Used in this Report

#### Blanks

| Version | Reagent<br>(Abs) | Acid<br>(Abs) | DI IC<br>(Abs) | DI TC<br>(Abs) | DI TOC<br>(Abs) | Save Time        | Operator          |
|---------|------------------|---------------|----------------|----------------|-----------------|------------------|-------------------|
| v1179   | 2.4107           | 1.3600        | 0.0000         | 0.0000         | 0.0000          | 2018/11/08 19:06 | Fusion1 (Fusion1) |
| v1180   | 1.9643           | 1.2980        | 0.0000         | 0.0000         | 0.0000          | 2018/11/12 19:41 | Fusion1 (Fusion1) |

#### Calibrations

Name: Extended Reaction 021711 (TOC)

Version: v19      Calibration curve      TOC:  $y = 6.957x + 26.664$   
 Ver Creation: 2018/11/02 21:13      formula:  
 Comment:       $r^2$  value:      TOC:  $r^2 = 0.99860$

Operator: Fusion1 (Fusion1)  
 Basic Analysis Type: TOC

about:blank

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11/14/2018

00954743

## Basic Analysis Type: TOC

| Sample ID | Y Raw Value | X Expected | Message | End Time         |
|-----------|-------------|------------|---------|------------------|
| 0.0 ppm   | 30.6200     | 0.0000     |         | 2018/11/02 19:35 |
| 0.50 ppm  | 29.8930     | 0.5000     |         | 2018/11/02 19:52 |
| 1.0 ppm   | 31.0960     | 1.0000     |         | 2018/11/02 20:07 |
| 5.00 ppm  | 57.3100     | 5.0000     |         | 2018/11/02 20:23 |
| 10.0 ppm  | 103.4310    | 10.0000    |         | 2018/11/02 20:40 |
| 25.0 ppm  | 194.0320    | 25.0000    |         | 2018/11/02 20:56 |
| 50.0 ppm  | 376.7910    | 50.0000    |         | 2018/11/02 21:12 |

## Methods

## Name: Extended Reaction 021711 (TOC)

Version: v3

Operator: Gen Chem Lab (Fusion1)

Ver Creation: 2013/02/04 11:44

Comment:

| Parameter                | Value      | Advanced Parameter         | Value      |
|--------------------------|------------|----------------------------|------------|
| SampleVolume             | 10.0 mL    | NeedleRinseVolume          | 5.0 ml     |
| Dilution                 | 1:10       | VialPrimeVolume            | 2.0 ml     |
| AcidVolume               | 0.5 ml     | ICSamplePrimeVolume        | 2.0 ml     |
| ReagentVolume            | 2.0 ml     | ICSpargeRinseVolume        | 12.0 ml    |
| UVReactorPreinse         | Off        | BaselineStabilizeTime      | 0.70 min   |
| UVReactorPreinseVolume   | 5.0        | DetectorPressureFlow       | 150 ml/min |
| NumberOfUVReactorPreinse | 1          | SyringeSpeedWaste          | 10         |
| ICSpargeTime             | 1.00 mins  | SyringeSpeedAcid           | 7          |
| DetectorSweepFlow        | 500 ml/min | SyringeSpeedReagent        | 7          |
| PreSpargeTime            | 4.00 mins  | SyringeSpeedDIWater        | 7          |
| SystemFlow               | 500 ml/min | NDIRPressurization         | 60 psig    |
|                          |            | SyringeSpeedSampleDispense | 5          |
|                          |            | SyringeSpeedSampleAspirate | 4          |
|                          |            | SyringeSpeedUVDDispense    | 7          |
|                          |            | SyringeSpeedUVAAspirate    | 5          |
|                          |            | SyringeSpeedICDispense     | 7          |
|                          |            | SyringeSpeedICAspirate     | 5          |
|                          |            | NDIRPressureStabilize      | 1.75 min   |
|                          |            | SampleMixing               | Off        |
|                          |            | SampleMixingCycles         | 1          |
|                          |            | SampleMixingVolume         | 10.0       |
|                          |            | LowLevelFilterNDIR         | Off        |

Acceptance / Approval

about:blank

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00954744



Electronic Signatures

| Report Version | User Name | Acceptance | Reason | Date |
|----------------|-----------|------------|--------|------|
|----------------|-----------|------------|--------|------|

Report History

Report History

| Report Version | User Name         | System Reason      | User Reason        | Date             |
|----------------|-------------------|--------------------|--------------------|------------------|
| 1              | Fusion1 (Fusion1) | Schedule completed | Schedule completed | 2018/11/14 13:23 |

StarLIMS Run: 614837, 614838, 614839  
Analysis: TOC  
Method: SM 5310 C, 9060A

CCV: 11-GEN-05-71A 50 ppm LCS: 11-GEN-05-69N 21.9 ppm

ICAL Date: 11/2/18

ICAL ID: 11-GEN-05-71E

ICS ID: 11-GEN-05-67D

ICS TV: 25.0 ppm ICS % R <1

Spike ID: 11-GEN-05-70O 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-71K

21 % H3PO4: 11-GEN-05-71L

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, Marge

FILTER ID: NA

|                                 |                         |
|---------------------------------|-------------------------|
| Analyzed By: CES                | Date Analyzed: 11/16/18 |
| Reviewed By: <i>[Signature]</i> | Date Reviewed: 11/16/18 |

**LABORATORY REPORT**

October 31, 2018

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road Suite 210  
Houston, TX 77099-4338

**RE: HS18101278**

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on October 25, 2018. For your reference, these analyses have been assigned our service request number P1805803.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**



By Kate Kaneko at 12:54 pm, 10/31/18

Kate Kaneko  
Laboratory Director

Client: ALS Laboratory Group  
Project: HS18101278

Service Request No: P1805803

---

### CASE NARRATIVE

The samples were received intact under chain of custody on October 25, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Carbon Dioxide Analysis

The samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

#### Methane, Ethene and Ethane Analysis

The samples were also analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

Client: ALS Laboratory Group  
Project: HS18101278

Service Request No: P1805803

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Manual integrations were performed on the following sample(s) and analyte(s). Refer to the raw data for additional information.

| Sample Identification(s) | Analyte(s) |
|--------------------------|------------|
| P1805803-001, 002        | Methane    |

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*

## ALS Environmental – Simi Valley

## CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

| Agency  | Web Site  | Number                     |
|---|---|----------------------------|
| Alaska DEC  | <a href="http://dec.alaska.gov/eh/lab.aspx">http://dec.alaska.gov/eh/lab.aspx</a>   | 17-019                     |
| Arizona DHS   | <a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a> | AZ0694                     |
| Florida DOH (NELAP)   | <a href="http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html">http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html</a>   | E871020                    |
| Louisiana DEQ (NELAP)   | <a href="http://www.deq.louisiana.gov/page/la-lab-accreditation">http://www.deq.louisiana.gov/page/la-lab-accreditation</a>   | 05071                      |
| Maine DHHS  | <a href="http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml">http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml</a>   | 2016036                    |
| Minnesota DOH (NELAP)   | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>   | 1347317                    |
| New Jersey DEP (NELAP)  | <a href="http://www.nj.gov/dep/enforcement/oqa.html">http://www.nj.gov/dep/enforcement/oqa.html</a>   | CA009                      |
| New York DOH (NELAP)  | <a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>   | 11221                      |
| Oregon PHD (NELAP)  | <a href="http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>                           | 4068-005                   |
| Pennsylvania DEP  | <a href="http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx">http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx</a>   | 68-03307<br>(Registration) |
| PJLA (DoD ELAP)   | <a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>   | 65818<br>(Testing)         |
| Texas CEQ (NELAP)   | <a href="http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html</a>   | T104704413-18-9            |
| Utah DOH (NELAP)  | <a href="http://health.utah.gov/lab/lab_cert_env">http://health.utah.gov/lab/lab_cert_env</a>   | CA016272018-9              |
| Washington DOE  | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>   | C946                       |
| <p>Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at <a href="http://www.alsglobal.com">www.alsglobal.com</a>, or at the accreditation body's website.</p> <p>Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.</p> |   |                            |



## ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: ALS Laboratory Group  
Project ID: HS18101278

Service Request: P1805803

Date Received: 10/25/2018  
Time Received: 09:30

| Client Sample ID | Lab Code     | Matrix | Date Collected | Time Collected | RSK 175 - CO2 | RSK 175 - Gases |
|------------------|--------------|--------|----------------|----------------|---------------|-----------------|
| 67WW13-181023    | P1805803-001 | Water  | 10/23/2018     | 09:35          | X             | X               |
| 67WW08-181023    | P1805803-002 | Water  | 10/23/2018     | 10:45          | X             | X               |
| 67WW08-181023-FD | P1805803-003 | Water  | 10/23/2018     | 10:45          | X             | X               |



P1805803

00954752

10450 Stancliff Rd, Ste 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

## Subcontract Chain of Custody

COC ID: 10093

### SUBCONTRACT TO:

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

Phone: +1 805 526 7161

### CUSTOMER INFORMATION:

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate  
Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

### INVOICE INFORMATION:

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS18101278  
**TSR:** Sonia West

|    | LAB SAMPLE ID                | CLIENT SAMPLE ID | MATRIX      | COLLECT DATE      |
|----|------------------------------|------------------|-------------|-------------------|
|    | ANALYSIS REQUESTED           |                  |             | DUE DATE          |
| 1. | HS18101278-04                | 67WW13-181023    | Groundwater | 23 Oct 2018 09:35 |
|    | MEE + CO2. DOD IV. Equis EDD |                  |             | 01 Nov 2018       |
| 2. | HS18101278-05                | 67WW08-181023    | Groundwater | 23 Oct 2018 10:45 |
|    | MEE + CO2. DOD IV. Equis EDD |                  |             | 01 Nov 2018       |
| 3. | HS18101278-06                | 67WW08-181023-FD | Groundwater | 23 Oct 2018 10:45 |
|    | MEE + CO2. DOD IV. Equis EDD |                  |             | 01 Nov 2018       |

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)

Relinquished By:

Date/Time:

10-24-18

Received By:

Date/Time:

10/25/18 0930

Cooler ID(s):

Temperature(s):

2° wif

RIGHT SOLUTIONS RIGHT PARTNER

### ALS Environmental Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805803  
 Project: HS18101278  
 Sample(s) received on: 10/25/18 Date opened: 10/25/18 by: ADAVID

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |   | <u>Yes</u>                          | <u>No</u>                           | <u>N/A</u>                          |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Did <b>sample container labels</b> and/or tags agree with custody papers?                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature: 2° C    Blank Temperature: ° C    Thermometer ID CO907034581    Wet Ice                     |                                     |                                     |                                     |
| 8 Were <b>custody seals</b> on outside of cooler/Box/Container?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Location of seal(s)? <u>Cooler lid.</u> Sealing Lid?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Were signature and date included?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Were seals intact?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?       | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 10 <b>Tubes:</b> Are the tubes capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 <b>Badges:</b> Are the badges properly capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

| Lab Sample ID   | Container Description | Required pH * | Received pH | Adjusted pH | VOA Headspace (Presence/Absence) | Receipt / Preservation Comments |
|-----------------|-----------------------|---------------|-------------|-------------|----------------------------------|---------------------------------|
| P1805803-001.01 | 40mL VOA NP           |               | 7           |             | A                                | MR 10/29/18                     |
| P1805803-001.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1805803-001.03 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1805803-002.01 | 40mL VOA NP           |               | 7           |             | A                                | MR 10/29/18                     |
| P1805803-002.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1805803-002.03 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1805803-003.01 | 40mL VOA NP           |               | 7           |             | A                                | MR 10/29/18                     |
| P1805803-003.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1805803-003.03 | 40mL VOA NP           |               |             |             | A                                |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |
|                 |                       |               |             |             |                                  |                                 |

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

[illegible]

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## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

Client: **ALS Laboratory Group**Client Project ID: **HS18101278**

ALS Project ID: P1805803

**Carbon Dioxide**

Test Code: RSK 175

Instrument ID: HP5890A/GC10/TCD

Analyst: Wade Henton

Matrix: Water

Test Notes:

Date(s) Collected: 10/23/18

Date Received: 10/25/18

Date Analyzed: 10/29/18

| Client Sample ID      | ALS Sample ID | Injection<br>Volume<br>ml(s) | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|-----------------------|---------------|------------------------------|----------------|-------------|-------------|-------------|-------------------|
| 67WW13-181023         | P1805803-001  | 0.050                        | <b>620,000</b> | 2,000       | 1,700       | 740         |                   |
| 67WW08-181023         | P1805803-002  | 0.050                        | <b>130,000</b> | 2,000       | 1,700       | 740         |                   |
| 67WW08-181023-FD      | P1805803-003  | 0.050                        | <b>130,000</b> | 2,000       | 1,700       | 740         |                   |
| Method Control Sample | P181029-MB    | 0.10                         | 860            | 1,000       | 860         | 370         | <b>U</b>          |

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18101278

ALS Project ID: P1805803  
 ALS Sample ID: P181029-DLCS

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/TCD  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 10/29/18  
**Volume(s) Analyzed:** NA ml(s)

| CAS #    | Compound       | Spike Amount       | Result <sub>i</sub> |              | % Recovery |      | DOD                  | RPD | RPD | Data      |
|----------|----------------|--------------------|---------------------|--------------|------------|------|----------------------|-----|-----|-----------|
|          |                | LCS / DLCS<br>ug/L | LCS<br>ug/L         | DLCS<br>ug/L | LCS        | DLCS | Acceptance<br>Limits |     |     |           |
| 124-38-9 | Carbon Dioxide | 22,900             | 20,200              | 19,400       | 88         | 85   | 80-122               | 3   | 15  | Qualifier |

<sub>i</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.



## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group**Client Sample ID:** 67WW13-181023**Client Project ID:** HS18101278

ALS Project ID: P1805803

ALS Sample ID: P1805803-001

**Test Code:** RSK 175**Instrument ID:** HP5890A/GC10/FID**Analyst:** Wade Henton**Matrix:** Water**Test Notes:**

Date Collected: 10/23/18

Date Received: 10/25/18

Date Analyzed: 10/29/18

Volume(s) Analyzed: 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 0.85           | 1.3         | 1.0         | 0.51        | <b>J, B</b>       |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | <b>U</b>          |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | <b>U</b>          |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

B = Analyte detected in both the sample and associated method blank.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group**Client Sample ID:** 67WW08-181023**Client Project ID:** HS18101278

ALS Project ID: P1805803

ALS Sample ID: P1805803-002

**Test Code:** RSK 175**Instrument ID:** HP5890A/GC10/FID**Analyst:** Wade Henton**Matrix:** Water**Test Notes:**

Date Collected: 10/23/18

Date Received: 10/25/18

Date Analyzed: 10/29/18

Volume(s) Analyzed: 0.050 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 5.4            | 2.6         | 2.0         | 1.0         | B                 |
| 74-85-1 | Ethene   | 1.1            | 2.0         | 1.1         | 0.48        | U                 |
| 74-84-0 | Ethane   | 0.94           | 1.2         | 0.94        | 0.32        | U                 |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

B = Analyte detected in both the sample and associated method blank.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group**Client Sample ID:** 67WW08-181023-FD**Client Project ID:** HS18101278

ALS Project ID: P1805803

ALS Sample ID: P1805803-003

**Test Code:** RSK 175**Instrument ID:** HP5890A/GC10/FID**Analyst:** Wade Henton**Matrix:** Water**Test Notes:**

Date Collected: 10/23/18

Date Received: 10/25/18

Date Analyzed: 10/29/18

Volume(s) Analyzed: 0.050 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 5.5            | 2.6         | 2.0         | 1.0         | B                 |
| 74-85-1 | Ethene   | 1.1            | 2.0         | 1.1         | 0.48        | U                 |
| 74-84-0 | Ethane   | 0.94           | 1.2         | 0.94        | 0.32        | U                 |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

B = Analyte detected in both the sample and associated method blank.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Method Control Sample  
**Client Project ID:** HS18101278

ALS Project ID: P1805803  
ALS Sample ID: P181029-MB

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/FID  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 10/29/18  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 0.58           | 1.3         | 1.0         | 0.51        | J                 |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | U                 |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | U                 |

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS18101278

ALS Project ID: P1805803  
 ALS Sample ID: P181029-LCS  
 P181029-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Wade Henton  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 10/29/18  
 Volume(s) Analyzed: 0.10 ml(s)

| CAS #   | Compound | Spike Amount | Result <sub>1</sub> |      | % Recovery |            | DOD        | RPD | RPD   | Data      |
|---------|----------|--------------|---------------------|------|------------|------------|------------|-----|-------|-----------|
|         |          | LCS / DLCS   | LCS                 | DLCS | LCS        | DLCS       | Acceptance |     |       |           |
|         |          | µg/L         | µg/L                | µg/L |            |            | Limits     |     | Limit | Qualifier |
| 74-82-8 | Methane  | 2.50         | 2.02                | 2.24 | <b>81</b>  | <b>90</b>  | 73-125     | 11  | 12    |           |
| 74-85-1 | Ethene   | 4.37         | 4.37                | 4.41 | <b>100</b> | <b>101</b> | 72-133     | 1   | 7     |           |
| 74-84-0 | Ethane   | 4.69         | 4.61                | 4.59 | <b>98</b>  | <b>98</b>  | 74-131     | 0   | 6     |           |

<sub>1</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.



---

10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
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November 02, 2018

Kim Napier  
Aptim Environmental & Infrastructure, Inc.  
2500 City West Blvd., Suite 1700  
Houston, TX 77042

Work Order: **HS18101528**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Kim,

ALS Environmental received 7 sample(s) on Oct 26, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER

RJ Modashia  
Project Manager

ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**Work Order:** HS18101528

**SAMPLE SUMMARY**

| Lab Samp ID   | Client Sample ID | Matrix      | TagNo         | Collection Date   | Date Received     | Hold                     |
|---------------|------------------|-------------|---------------|-------------------|-------------------|--------------------------|
| HS18101528-01 | 67WW05-181025    | Groundwater |               | 25-Oct-2018 09:30 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-02 | 67WW05-181025-FD | Groundwater |               | 25-Oct-2018 09:30 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-03 | 67WW02-181025    | Groundwater |               | 25-Oct-2018 10:25 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-04 | 67WW07-181025    | Groundwater |               | 25-Oct-2018 11:25 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-05 | 67WW09A-181025   | Groundwater |               | 25-Oct-2018 12:25 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-06 | 67WW16I-181025   | Groundwater |               | 25-Oct-2018 13:20 | 26-Oct-2018 08:45 | <input type="checkbox"/> |
| HS18101528-07 | Trip Blank       | Water       | ALS-101218-25 | 25-Oct-2018 00:00 | 26-Oct-2018 08:45 | <input type="checkbox"/> |



**ALS Houston, US**

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.**CASE NARRATIVE****Project:** Longhorn Army Ammunition Plant**Work Order:** HS18101528

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**GCMS Volatiles by Method SW8260****Batch ID: R326668****Sample ID: 67WW09A-181025 (HS18101528-05MS)**

- MS and/or MSD recovered outside control limits for multiple compounds
-

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW05-181025  
 Collection Date: 25-Oct-2018 09:30

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-01  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 16:44 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW05-181025  
 Collection Date: 25-Oct-2018 09:30

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-01  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Chloromethane                         | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| cis-1,2-Dichloroethene                | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Dibromomethane                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Ethylbenzene                          | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0  | 1.0      | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| m,p-Xylene                            | 1.0         | U                    | 0.50 | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Methylene chloride                    | 1.0         | U                    | 1.0  | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Naphthalene                           | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| o-Xylene                              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Styrene                               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Toluene                               | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Trichloroethene                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| Vinyl chloride                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 16:44        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>94.6</i> |                      |      | <b>0</b> | <i>70-126</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 16:44</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>98.5</i> |                      |      | <b>0</b> | <i>81-113</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 16:44</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>96.9</i> |                      |      | <b>0</b> | <i>77-123</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 16:44</i> |
| <i>Surr: Toluene-d8</i>               | <i>91.5</i> |                      |      | <b>0</b> | <i>82-127</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 16:44</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW05-181025-FD  
 Collection Date: 25-Oct-2018 09:30

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-02  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:08 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW05-181025-FD  
 Collection Date: 25-Oct-2018 09:30

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-02  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Chloromethane                         | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| cis-1,2-Dichloroethene                | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Dibromomethane                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Ethylbenzene                          | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0  | 1.0      | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| m,p-Xylene                            | 1.0         | U                    | 0.50 | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Methylene chloride                    | 1.0         | U                    | 1.0  | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Naphthalene                           | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| o-Xylene                              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Styrene                               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Toluene                               | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Trichloroethene                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| Vinyl chloride                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 17:08        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>95.1</i> |                      |      | <b>0</b> | <i>70-126</i> | <b>%REC</b> | <i>1</i>           | <i>01-Nov-2018 17:08</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.2</i> |                      |      | <b>0</b> | <i>81-113</i> | <b>%REC</b> | <i>1</i>           | <i>01-Nov-2018 17:08</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>96.7</i> |                      |      | <b>0</b> | <i>77-123</i> | <b>%REC</b> | <i>1</i>           | <i>01-Nov-2018 17:08</i> |
| <i>Surr: Toluene-d8</i>               | <i>94.2</i> |                      |      | <b>0</b> | <i>82-127</i> | <b>%REC</b> | <i>1</i>           | <i>01-Nov-2018 17:08</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW02-181025  
 Collection Date: 25-Oct-2018 10:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-03  
 Matrix:Groundwater

| ANALYSES                              | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,1,1-Trichloroethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,1,2,2-Tetrachloroethane             | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,1,2-Trichloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,1-Dichloroethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| <b>1,1-Dichloroethene</b>             | <b>6.9</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>ug/L</b> | 1                  | 01-Nov-2018 17:32 |
| 1,1-Dichloropropene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2,3-Trichlorobenzene                | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2,3-Trichloropropane                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2,4-Trichlorobenzene                | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2,4-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2-Dibromo-3-chloropropane           | 1.0        | U                    | 1.0         | 1.0         | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2-Dibromoethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2-Dichlorobenzene                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2-Dichloroethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,2-Dichloropropane                   | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,3,5-Trimethylbenzene                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,3-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,3-Dichloropropane                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 1,4-Dichlorobenzene                   | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 2,2-Dichloropropane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 2-Butanone                            | 1.0        | U                    | 0.50        | 1.0         | 2.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 2-Chlorotoluene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 2-Hexanone                            | 1.0        | U                    | 1.0         | 1.0         | 2.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 4-Chlorotoluene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 4-Isopropyltoluene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| 4-Methyl-2-pentanone                  | 1.0        | U                    | 0.70        | 1.0         | 2.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Acetone                               | 2.0        | U                    | 2.0         | 2.0         | 2.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Benzene                               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Bromobenzene                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Bromochloromethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Bromodichloromethane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Bromoform                             | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Bromomethane                          | 0.50       | U                    | 0.40        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Carbon disulfide                      | 1.0        | U                    | 0.60        | 1.0         | 2.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Carbon tetrachloride                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Chlorobenzene                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |
| Chloroethane                          | 0.50       | U                    | 0.30        | 0.50        | 1.0        | ug/L        | 1                  | 01-Nov-2018 17:32 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW02-181025  
 Collection Date: 25-Oct-2018 10:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-03  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:32 |
| Surr: 1,2-Dichloroethane-d4           | 95.7   |                      |      | 0    | 70-126 | %REC  | 1                  | 01-Nov-2018 17:32 |
| Surr: 4-Bromofluorobenzene            | 99.0   |                      |      | 0    | 81-113 | %REC  | 1                  | 01-Nov-2018 17:32 |
| Surr: Dibromofluoromethane            | 97.2   |                      |      | 0    | 77-123 | %REC  | 1                  | 01-Nov-2018 17:32 |
| Surr: Toluene-d8                      | 93.6   |                      |      | 0    | 82-127 | %REC  | 1                  | 01-Nov-2018 17:32 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW07-181025  
 Collection Date: 25-Oct-2018 11:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-04  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 17:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW07-181025  
 Collection Date: 25-Oct-2018 11:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-04  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 17:57 |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | 96.2   |                      |      | 0    | 70-126 | %REC  | 1                  | 01-Nov-2018 17:57 |
| <i>Surr: 4-Bromofluorobenzene</i>     | 98.1   |                      |      | 0    | 81-113 | %REC  | 1                  | 01-Nov-2018 17:57 |
| <i>Surr: Dibromofluoromethane</i>     | 98.8   |                      |      | 0    | 77-123 | %REC  | 1                  | 01-Nov-2018 17:57 |
| <i>Surr: Toluene-d8</i>               | 93.7   |                      |      | 0    | 82-127 | %REC  | 1                  | 01-Nov-2018 17:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW09A-181025  
 Collection Date: 25-Oct-2018 12:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-05  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:21 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW09A-181025  
 Collection Date: 25-Oct-2018 12:25

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-05  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Chloromethane                         | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| cis-1,2-Dichloroethene                | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Dibromomethane                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Ethylbenzene                          | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0  | 1.0      | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| m,p-Xylene                            | 1.0         | U                    | 0.50 | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Methylene chloride                    | 1.0         | U                    | 1.0  | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Naphthalene                           | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| o-Xylene                              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Styrene                               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Toluene                               | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Trichloroethene                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| Vinyl chloride                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:21        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>96.7</i> |                      |      | <b>0</b> | <i>70-126</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:21</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.1</i> |                      |      | <b>0</b> | <i>81-113</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:21</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>99.5</i> |                      |      | <b>0</b> | <i>77-123</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:21</i> |
| <i>Surr: Toluene-d8</i>               | <i>94.0</i> |                      |      | <b>0</b> | <i>82-127</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:21</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW16I-181025  
 Collection Date: 25-Oct-2018 13:20

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-06  
 Matrix:Groundwater

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1                  | 01-Nov-2018 18:46 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: 67WW16I-181025  
 Collection Date: 25-Oct-2018 13:20

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-06  
 Matrix:Groundwater

| ANALYSES                              | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: AKP             |
| Chloroform                            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Chloromethane                         | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| cis-1,2-Dichloroethene                | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| cis-1,3-Dichloropropene               | 0.50        | U                    | 0.10 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Dibromochloromethane                  | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Dibromomethane                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Dichlorodifluoromethane               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Ethylbenzene                          | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Hexachlorobutadiene                   | 1.0         | U                    | 1.0  | 1.0      | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Isopropylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| m,p-Xylene                            | 1.0         | U                    | 0.50 | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Methylene chloride                    | 1.0         | U                    | 1.0  | 1.0      | 2.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| n-Butylbenzene                        | 0.50        | U                    | 0.40 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| n-Propylbenzene                       | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Naphthalene                           | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| o-Xylene                              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| sec-Butylbenzene                      | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Styrene                               | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| tert-Butylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Tetrachloroethene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Toluene                               | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| trans-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| trans-1,3-Dichloropropene             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Trichloroethene                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Trichlorofluoromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| Vinyl chloride                        | 0.50        | U                    | 0.20 | 0.50     | 1.0           | ug/L        | 1                  | 01-Nov-2018 18:46        |
| <i>Surr: 1,2-Dichloroethane-d4</i>    | <i>91.9</i> |                      |      | <b>0</b> | <i>70-126</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:46</i> |
| <i>Surr: 4-Bromofluorobenzene</i>     | <i>99.9</i> |                      |      | <b>0</b> | <i>81-113</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:46</i> |
| <i>Surr: Dibromofluoromethane</i>     | <i>95.1</i> |                      |      | <b>0</b> | <i>77-123</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:46</i> |
| <i>Surr: Toluene-d8</i>               | <i>94.3</i> |                      |      | <b>0</b> | <i>82-127</i> | <i>%REC</i> | <i>1</i>           | <i>01-Nov-2018 18:46</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: Trip Blank  
 Collection Date: 25-Oct-2018 00:00

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-07  
 Matrix:Water

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION FACTOR | DATE ANALYZED     |
|---------------------------------------|--------|----------------------|------|------|-----|-------|-----------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |     |       |                 | Analyst: AKP      |
| 1,1,1,2-Tetrachloroethane             | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1,1-Trichloroethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1,2,2-Tetrachloroethane             | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1,2-Trichloroethane                 | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1-Dichloroethene                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,1-Dichloropropene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2,3-Trichlorobenzene                | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2,3-Trichloropropane                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2,4-Trichlorobenzene                | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2,4-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2-Dibromo-3-chloropropane           | 1.0    | U                    | 1.0  | 1.0  | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2-Dibromoethane                     | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2-Dichlorobenzene                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2-Dichloroethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,2-Dichloropropane                   | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,3,5-Trimethylbenzene                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,3-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,3-Dichloropropane                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 1,4-Dichlorobenzene                   | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 2,2-Dichloropropane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 2-Butanone                            | 1.0    | U                    | 0.50 | 1.0  | 2.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 2-Chlorotoluene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 2-Hexanone                            | 1.0    | U                    | 1.0  | 1.0  | 2.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 4-Chlorotoluene                       | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 4-Isopropyltoluene                    | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| 4-Methyl-2-pentanone                  | 1.0    | U                    | 0.70 | 1.0  | 2.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Acetone                               | 2.0    | U                    | 2.0  | 2.0  | 2.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Benzene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Bromobenzene                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Bromochloromethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Bromodichloromethane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Bromoform                             | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Bromomethane                          | 0.50   | U                    | 0.40 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Carbon disulfide                      | 1.0    | U                    | 0.60 | 1.0  | 2.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Carbon tetrachloride                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Chlorobenzene                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |
| Chloroethane                          | 0.50   | U                    | 0.30 | 0.50 | 1.0 | ug/L  | 1               | 01-Nov-2018 16:19 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant  
 Sample ID: Trip Blank  
 Collection Date: 25-Oct-2018 00:00

## ANALYTICAL REPORT

WorkOrder:HS18101528  
 Lab ID:HS18101528-07  
 Matrix:Water

| ANALYSES                              | RESULT | QUAL                 | DL   | LOD  | LOQ    | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---------------------------------------|--------|----------------------|------|------|--------|-------|--------------------|-------------------|
| <b>LOW LEVEL VOLATILES BY SW8260C</b> |        | <b>Method:SW8260</b> |      |      |        |       |                    | Analyst: AKP      |
| Chloroform                            | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Chloromethane                         | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| cis-1,2-Dichloroethene                | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| cis-1,3-Dichloropropene               | 0.50   | U                    | 0.10 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Dibromochloromethane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Dibromomethane                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Dichlorodifluoromethane               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Ethylbenzene                          | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Hexachlorobutadiene                   | 1.0    | U                    | 1.0  | 1.0  | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Isopropylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| m,p-Xylene                            | 1.0    | U                    | 0.50 | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Methylene chloride                    | 1.0    | U                    | 1.0  | 1.0  | 2.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| n-Butylbenzene                        | 0.50   | U                    | 0.40 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| n-Propylbenzene                       | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Naphthalene                           | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| o-Xylene                              | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| sec-Butylbenzene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Styrene                               | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| tert-Butylbenzene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Tetrachloroethene                     | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Toluene                               | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| trans-1,2-Dichloroethene              | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| trans-1,3-Dichloropropene             | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Trichloroethene                       | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Trichlorofluoromethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Vinyl chloride                        | 0.50   | U                    | 0.20 | 0.50 | 1.0    | ug/L  | 1                  | 01-Nov-2018 16:19 |
| Surr: 1,2-Dichloroethane-d4           | 95.5   |                      |      | 0    | 70-126 | %REC  | 1                  | 01-Nov-2018 16:19 |
| Surr: 4-Bromofluorobenzene            | 98.4   |                      |      | 0    | 81-113 | %REC  | 1                  | 01-Nov-2018 16:19 |
| Surr: Dibromofluoromethane            | 96.8   |                      |      | 0    | 77-123 | %REC  | 1                  | 01-Nov-2018 16:19 |
| Surr: Toluene-d8                      | 93.6   |                      |      | 0    | 82-127 | %REC  | 1                  | 01-Nov-2018 16:19 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

**DATES REPORT**

| Sample ID               | Client Samp ID                                    | Collection Date   | TCLP Date | Prep Date                  | Analysis Date     | DF |
|-------------------------|---|-------------------|-----------|----------------------------|-------------------|----|
| <b>Batch ID</b> R326668 | <b>Test Name :</b> LOW LEVEL VOLATILES BY SW8260C |                   |           | <b>Matrix:</b> Water       |                   |    |
| HS18101528-07           | Trip Blank  | 25 Oct 2018 00:00 |           |                            | 01 Nov 2018 16:19 | 1  |
| <b>Batch ID</b> R326668 | <b>Test Name :</b> LOW LEVEL VOLATILES BY SW8260C |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS18101528-01           | 67WW05-181025                                     | 25 Oct 2018 09:30 |           |                            | 01 Nov 2018 16:44 | 1  |
| HS18101528-02           | 67WW05-181025-FD                                  | 25 Oct 2018 09:30 |           |                            | 01 Nov 2018 17:08 | 1  |
| HS18101528-03           | 67WW02-181025                                     | 25 Oct 2018 10:25 |           |                            | 01 Nov 2018 17:32 | 1  |
| HS18101528-04           | 67WW07-181025                                     | 25 Oct 2018 11:25 |           |                            | 01 Nov 2018 17:57 | 1  |
| HS18101528-05           | 67WW09A-181025                                    | 25 Oct 2018 12:25 |           |                            | 01 Nov 2018 18:21 | 1  |
| HS18101528-06           | 67WW16I-181025                                    | 25 Oct 2018 13:20 |           |                            | 01 Nov 2018 18:46 | 1  |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                    |                         | Instrument: VOA2 |         | Method: SW8260 |                                  |               |               |      |           |      |
|--------------------------------------|-------------------------|------------------|---------|----------------|----------------------------------|---------------|---------------|------|-----------|------|
| MBLK                                 | Sample ID: VBLKW-181101 | Units: ug/L      |         |                | Analysis Date: 01-Nov-2018 11:38 |               |               |      |           |      |
| Client ID:                           | Run ID: VOA2_326668     | SeqNo: 4801123   |         | PrepDate:      |                                  | DF: 1         |               |      |           |      |
| Analyte                              | Result                  | PQL              | SPK Val | SPK Ref Value  | %REC                             | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| 1,1,1,2-Tetrachloroethane            | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1,1-Trichloroethane                | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1,2,2-Tetrachloroethane            | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1,2-Trichloroethane                | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1-Dichloroethane                   | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1-Dichloroethene                   | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,1-Dichloropropene                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2,3-Trichlorobenzene               | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2,3-Trichloropropane               | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2,4-Trichlorobenzene               | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2,4-Trimethylbenzene               | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2-Dibromo-3-chloropropane          | 1.0                     | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2-Dibromoethane                    | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2-Dichlorobenzene                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2-Dichloroethane                   | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,2-Dichloropropane                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,3,5-Trimethylbenzene               | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,3-Dichlorobenzene                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,3-Dichloropropane                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 1,4-Dichlorobenzene                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 2,2-Dichloropropane                  | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 2-Butanone                           | 1.0                     | 2.0              |         |                |                                  |               |               |      |           | U    |
| 2-Chlorotoluene                      | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 2-Hexanone                           | 1.0                     | 2.0              |         |                |                                  |               |               |      |           | U    |
| 4-Chlorotoluene                      | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 4-Isopropyltoluene                   | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| 4-Methyl-2-pentanone                 | 1.0                     | 2.0              |         |                |                                  |               |               |      |           | U    |
| Acetone                              | 2.0                     | 2.0              |         |                |                                  |               |               |      |           | U    |
| Benzene                              | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| Bromobenzene                         | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| Bromochloromethane                   | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| Bromodichloromethane                 | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |
| Bromoform                            | 0.50                    | 1.0              |         |                |                                  |               |               |      |           | U    |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668           |                         | Instrument: VOA2 |         | Method: SW8260                   |      |               |               |      |                |
|-----------------------------|-------------------------|------------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| <b>MBLK</b>                 | Sample ID: VBLKW-181101 | Units: ug/L      |         | Analysis Date: 01-Nov-2018 11:38 |      |               |               |      |                |
| Client ID:                  | Run ID: VOA2_326668     | SeqNo: 4801123   |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                     | Result                  | PQL              | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Bromomethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Carbon disulfide            | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Carbon tetrachloride        | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chlorobenzene               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloroethane                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloroform                  | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Chloromethane               | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| cis-1,2-Dichloroethene      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| cis-1,3-Dichloropropene     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dibromochloromethane        | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dibromomethane              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Dichlorodifluoromethane     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Ethylbenzene                | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Hexachlorobutadiene         | 1.0                     | 1.0              |         |                                  |      |               |               |      | U              |
| Isopropylbenzene            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| m,p-Xylene                  | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Methylene chloride          | 1.0                     | 2.0              |         |                                  |      |               |               |      | U              |
| Naphthalene                 | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| n-Butylbenzene              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| n-Propylbenzene             | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| o-Xylene                    | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| sec-Butylbenzene            | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Styrene                     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| tert-Butylbenzene           | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Tetrachloroethene           | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Toluene                     | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| trans-1,2-Dichloroethene    | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| trans-1,3-Dichloropropene   | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Trichloroethene             | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Trichlorofluoromethane      | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Vinyl chloride              | 0.50                    | 1.0              |         |                                  |      |               |               |      | U              |
| Surr: 1,2-Dichloroethane-d4 | 47.1                    | 1.0              | 50      | 0                                | 94.2 | 70 - 123      |               |      |                |
| Surr: 4-Bromofluorobenzene  | 48.98                   | 1.0              | 50      | 0                                | 98.0 | 82 - 115      |               |      |                |
| Surr: Dibromofluoromethane  | 48.5                    | 1.0              | 50      | 0                                | 97.0 | 73 - 126      |               |      |                |

ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

**QC BATCH REPORT**

| Batch ID: R326668       |                                | Instrument: VOA2      |           | Method: SW8260                          |   |
|-------------------------|--------------------------------|-----------------------|-----------|---|---|
| <b>MBLK</b>             | Sample ID: <b>VBLKW-181101</b> | Units: <b>ug/L</b>    |           | Analysis Date: <b>01-Nov-2018 11:38</b> |   |
| Client ID:              | Run ID: <b>VOA2_326668</b>     | SeqNo: <b>4801123</b> |           | PrepDate:                               | DF: <b>1</b>                                    |
| Analyte                 | Result                         | PQL                   | SPK Val   | SPK Ref Value %REC                      | Control Limit RPD Ref Value %RPD RPD Limit Qual |
| <i>Surr: Toluene-d8</i> | <i>46.73</i>                   | <i>1.0</i>            | <i>50</i> | <i>0 93.5</i>                           | <i>81 - 120</i>                                 |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                    |        | Instrument: VOA2               |         | Method: SW8260        |      |   |               |              |           |      |
|--------------------------------------|--------|--------------------------------|---------|-----------------------|------|---|---------------|--------------|-----------|------|
| <b>LCS</b>                           |        | Sample ID: <b>VLCSW-181101</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 10:49</b> |               |              |           |      |
| Client ID:                           |        | Run ID: <b>VOA2_326668</b>     |         | SeqNo: <b>4801121</b> |      | PrepDate:                               |               | DF: <b>1</b> |           |      |
| Analyte                              | Result | PQL                            | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit | Qual |
| 1,1,1,2-Tetrachloroethane            | 19.77  | 1.0                            | 20      | 0                     | 98.9 | 77 - 118                                |               |              |           |      |
| 1,1,1-Trichloroethane                | 18.99  | 1.0                            | 20      | 0                     | 94.9 | 70 - 130                                |               |              |           |      |
| 1,1,2,2-Tetrachloroethane            | 18.08  | 1.0                            | 20      | 0                     | 90.4 | 70 - 120                                |               |              |           |      |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 21.58  | 1.0                            | 20      | 0                     | 108  | 70 - 130                                |               |              |           |      |
| 1,1,2-Trichloroethane                | 20.2   | 1.0                            | 20      | 0                     | 101  | 77 - 113                                |               |              |           |      |
| 1,1-Dichloroethane                   | 19.84  | 1.0                            | 20      | 0                     | 99.2 | 71 - 122                                |               |              |           |      |
| 1,1-Dichloroethene                   | 19.18  | 1.0                            | 20      | 0                     | 95.9 | 70 - 130                                |               |              |           |      |
| 1,1-Dichloropropene                  | 21.4   | 1.0                            | 20      | 0                     | 107  | 78 - 118                                |               |              |           |      |
| 1,2,3-Trichlorobenzene               | 16.82  | 1.0                            | 20      | 0                     | 84.1 | 70 - 130                                |               |              |           |      |
| 1,2,3-Trichloropropane               | 18.23  | 1.0                            | 20      | 0                     | 91.1 | 70 - 127                                |               |              |           |      |
| 1,2,4-Trichlorobenzene               | 17.72  | 1.0                            | 20      | 0                     | 88.6 | 77 - 126                                |               |              |           |      |
| 1,2,4-Trimethylbenzene               | 20.25  | 1.0                            | 20      | 0                     | 101  | 73 - 121                                |               |              |           |      |
| 1,2-Dibromo-3-chloropropane          | 16.4   | 1.0                            | 20      | 0                     | 82.0 | 70 - 130                                |               |              |           |      |
| 1,2-Dibromoethane                    | 20.35  | 1.0                            | 20      | 0                     | 102  | 76 - 123                                |               |              |           |      |
| 1,2-Dichlorobenzene                  | 18.99  | 1.0                            | 20      | 0                     | 94.9 | 77 - 113                                |               |              |           |      |
| 1,2-Dichloroethane                   | 20.64  | 1.0                            | 20      | 0                     | 103  | 70 - 124                                |               |              |           |      |
| 1,2-Dichloropropane                  | 21.31  | 1.0                            | 20      | 0                     | 107  | 72 - 119                                |               |              |           |      |
| 1,3,5-Trimethylbenzene               | 18.62  | 1.0                            | 20      | 0                     | 93.1 | 75 - 118                                |               |              |           |      |
| 1,3-Dichlorobenzene                  | 19.34  | 1.0                            | 20      | 0                     | 96.7 | 78 - 118                                |               |              |           |      |
| 1,3-Dichloropropane                  | 20.43  | 1.0                            | 20      | 0                     | 102  | 75 - 116                                |               |              |           |      |
| 1,4-Dichlorobenzene                  | 19.57  | 1.0                            | 20      | 0                     | 97.9 | 79 - 113                                |               |              |           |      |
| 2,2-Dichloropropane                  | 22.82  | 1.0                            | 20      | 0                     | 114  | 70 - 130                                |               |              |           |      |
| 2-Butanone                           | 40.22  | 2.0                            | 40      | 0                     | 101  | 70 - 130                                |               |              |           |      |
| 2-Chlorotoluene                      | 20.67  | 1.0                            | 20      | 0                     | 103  | 70 - 128                                |               |              |           |      |
| 2-Hexanone                           | 40.4   | 2.0                            | 40      | 0                     | 101  | 70 - 130                                |               |              |           |      |
| 4-Chlorotoluene                      | 21.15  | 1.0                            | 20      | 0                     | 106  | 74 - 126                                |               |              |           |      |
| 4-Isopropyltoluene                   | 17.6   | 1.0                            | 20      | 0                     | 88.0 | 74 - 126                                |               |              |           |      |
| 4-Methyl-2-pentanone                 | 41.52  | 2.0                            | 40      | 0                     | 104  | 70 - 130                                |               |              |           |      |
| Acetone                              | 39.53  | 2.0                            | 40      | 0                     | 98.8 | 70 - 130                                |               |              |           |      |
| Benzene                              | 19.77  | 1.0                            | 20      | 0                     | 98.8 | 74 - 120                                |               |              |           |      |
| Bromobenzene                         | 18.97  | 1.0                            | 20      | 0                     | 94.9 | 78 - 113                                |               |              |           |      |
| Bromochloromethane                   | 19.83  | 1.0                            | 20      | 0                     | 99.1 | 76 - 124                                |               |              |           |      |
| Bromodichloromethane                 | 20.75  | 1.0                            | 20      | 0                     | 104  | 74 - 122                                |               |              |           |      |
| Bromoform                            | 19.54  | 1.0                            | 20      | 0                     | 97.7 | 73 - 128                                |               |              |           |      |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668           |        | Instrument: VOA2               |         | Method: SW8260        |      |   |               |              |           |      |
|-----------------------------|--------|--------------------------------|---------|-----------------------|------|---|---------------|--------------|-----------|------|
| <b>LCS</b>                  |        | Sample ID: <b>VLCSW-181101</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 10:49</b> |               |              |           |      |
| Client ID:                  |        | Run ID: <b>VOA2_326668</b>     |         | SeqNo: <b>4801121</b> |      | PrepDate:                               |               | DF: <b>1</b> |           |      |
| Analyte                     | Result | PQL                            | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit | Qual |
| Bromomethane                | 23.97  | 1.0                            | 20      | 0                     | 120  | 70 - 130                                |               |              |           |      |
| Carbon disulfide            | 38.55  | 2.0                            | 40      | 0                     | 96.4 | 70 - 130                                |               |              |           |      |
| Carbon tetrachloride        | 20.76  | 1.0                            | 20      | 0                     | 104  | 71 - 125                                |               |              |           |      |
| Chlorobenzene               | 20.04  | 1.0                            | 20      | 0                     | 100  | 76 - 113                                |               |              |           |      |
| Chloroethane                | 20.6   | 1.0                            | 20      | 0                     | 103  | 70 - 130                                |               |              |           |      |
| Chloroform                  | 19.41  | 1.0                            | 20      | 0                     | 97.1 | 71 - 121                                |               |              |           |      |
| Chloromethane               | 20.06  | 1.0                            | 20      | 0                     | 100  | 70 - 129                                |               |              |           |      |
| cis-1,2-Dichloroethene      | 19.98  | 1.0                            | 20      | 0                     | 99.9 | 75 - 122                                |               |              |           |      |
| cis-1,3-Dichloropropene     | 22.45  | 1.0                            | 20      | 0                     | 112  | 73 - 127                                |               |              |           |      |
| Dibromochloromethane        | 20.05  | 1.0                            | 20      | 0                     | 100  | 77 - 122                                |               |              |           |      |
| Dibromomethane              | 20.91  | 1.0                            | 20      | 0                     | 105  | 78 - 121                                |               |              |           |      |
| Dichlorodifluoromethane     | 19.55  | 1.0                            | 20      | 0                     | 97.8 | 70 - 130                                |               |              |           |      |
| Ethylbenzene                | 21.28  | 1.0                            | 20      | 0                     | 106  | 77 - 117                                |               |              |           |      |
| Hexachlorobutadiene         | 19.22  | 1.0                            | 20      | 0                     | 96.1 | 70 - 130                                |               |              |           |      |
| Isopropylbenzene            | 19.23  | 1.0                            | 20      | 0                     | 96.1 | 73 - 127                                |               |              |           |      |
| m,p-Xylene                  | 43.49  | 2.0                            | 40      | 0                     | 109  | 77 - 122                                |               |              |           |      |
| Methylene chloride          | 19.43  | 2.0                            | 20      | 0                     | 97.2 | 70 - 127                                |               |              |           |      |
| Naphthalene                 | 15.26  | 1.0                            | 20      | 0                     | 76.3 | 70 - 130                                |               |              |           |      |
| n-Butylbenzene              | 20.06  | 1.0                            | 20      | 0                     | 100  | 72 - 130                                |               |              |           |      |
| n-Propylbenzene             | 21.07  | 1.0                            | 20      | 0                     | 105  | 73 - 124                                |               |              |           |      |
| o-Xylene                    | 21.22  | 1.0                            | 20      | 0                     | 106  | 75 - 119                                |               |              |           |      |
| sec-Butylbenzene            | 18.35  | 1.0                            | 20      | 0                     | 91.7 | 73 - 128                                |               |              |           |      |
| Styrene                     | 20.07  | 1.0                            | 20      | 0                     | 100  | 72 - 126                                |               |              |           |      |
| tert-Butylbenzene           | 20.17  | 1.0                            | 20      | 0                     | 101  | 73 - 124                                |               |              |           |      |
| Tetrachloroethene           | 19.56  | 1.0                            | 20      | 0                     | 97.8 | 76 - 119                                |               |              |           |      |
| Toluene                     | 19.55  | 1.0                            | 20      | 0                     | 97.7 | 77 - 118                                |               |              |           |      |
| trans-1,2-Dichloroethene    | 19.78  | 1.0                            | 20      | 0                     | 98.9 | 72 - 127                                |               |              |           |      |
| trans-1,3-Dichloropropene   | 22.57  | 1.0                            | 20      | 0                     | 113  | 77 - 119                                |               |              |           |      |
| Trichloroethene             | 19.51  | 1.0                            | 20      | 0                     | 97.6 | 77 - 121                                |               |              |           |      |
| Trichlorofluoromethane      | 21.18  | 1.0                            | 20      | 0                     | 106  | 70 - 130                                |               |              |           |      |
| Vinyl chloride              | 21.13  | 1.0                            | 20      | 0                     | 106  | 70 - 130                                |               |              |           |      |
| Surr: 1,2-Dichloroethane-d4 | 49.69  | 1.0                            | 50      | 0                     | 99.4 | 70 - 130                                |               |              |           |      |
| Surr: 4-Bromofluorobenzene  | 50.88  | 1.0                            | 50      | 0                     | 102  | 82 - 115                                |               |              |           |      |
| Surr: Dibromofluoromethane  | 48.38  | 1.0                            | 50      | 0                     | 96.8 | 73 - 126                                |               |              |           |      |



ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

**QC BATCH REPORT**

| Batch ID: R326668 |                         | Instrument: VOA2 |         | Method: SW8260 |                                  |               |               |      |           |      |
|-------------------|-------------------------|------------------|---------|----------------|----------------------------------|---------------|---------------|------|-----------|------|
| LCS               | Sample ID: VLCSW-181101 | Units: ug/L      |         |                | Analysis Date: 01-Nov-2018 10:49 |               |               |      |           |      |
| Client ID:        | Run ID: VOA2_326668     | SeqNo: 4801121   |         | PrepDate:      |                                  | DF: 1         |               |      |           |      |
| Analyte           | Result                  | PQL              | SPK Val | SPK Ref Value  | %REC                             | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Surr: Toluene-d8  | 45.32                   | 1.0              | 50      | 0              | 90.6                             | 81 - 120      |               |      |           |      |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                    |        | Instrument: VOA2                  |         | Method: SW8260        |      |   |               |              |                |
|--------------------------------------|--------|-----------------------------------|---------|-----------------------|------|---|---------------|--------------|----------------|
| <b>MS</b>                            |        | Sample ID: <b>HS18101528-05MS</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 19:59</b> |               |              |                |
| Client ID: <b>67WW09A-181025</b>     |        | Run ID: <b>VOA2_326668</b>        |         | SeqNo: <b>4801138</b> |      | PrepDate:                               |               | DF: <b>1</b> |                |
| Analyte                              | Result | PQL                               | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 18.03  | 1.0                               | 20      | 0                     | 90.2 | 70 - 120                                |               |              |                |
| 1,1,1-Trichloroethane                | 18.22  | 1.0                               | 20      | 0                     | 91.1 | 70 - 130                                |               |              |                |
| 1,1,2,2-Tetrachloroethane            | 14.6   | 1.0                               | 20      | 0                     | 73.0 | 70 - 123                                |               |              |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 22.36  | 1.0                               | 20      | 0                     | 112  | 70 - 130                                |               |              |                |
| 1,1,2-Trichloroethane                | 16.98  | 1.0                               | 20      | 0                     | 84.9 | 70 - 117                                |               |              |                |
| 1,1-Dichloroethane                   | 18.87  | 1.0                               | 20      | 0                     | 94.4 | 70 - 127                                |               |              |                |
| 1,1-Dichloroethene                   | 18.51  | 1.0                               | 20      | 0                     | 92.6 | 70 - 130                                |               |              |                |
| 1,1-Dichloropropene                  | 20.47  | 1.0                               | 20      | 0                     | 102  | 70 - 129                                |               |              |                |
| 1,2,3-Trichlorobenzene               | 13.68  | 1.0                               | 20      | 0                     | 68.4 | 70 - 130                                |               |              | S              |
| 1,2,3-Trichloropropane               | 14.43  | 1.0                               | 20      | 0                     | 72.1 | 70 - 130                                |               |              |                |
| 1,2,4-Trichlorobenzene               | 15.03  | 1.0                               | 20      | 0                     | 75.1 | 70 - 125                                |               |              |                |
| 1,2,4-Trimethylbenzene               | 17.72  | 1.0                               | 20      | 0                     | 88.6 | 70 - 125                                |               |              |                |
| 1,2-Dibromo-3-chloropropane          | 13.37  | 1.0                               | 20      | 0                     | 66.8 | 70 - 130                                |               |              | S              |
| 1,2-Dibromoethane                    | 17.62  | 1.0                               | 20      | 0                     | 88.1 | 70 - 124                                |               |              |                |
| 1,2-Dichlorobenzene                  | 16.57  | 1.0                               | 20      | 0                     | 82.8 | 70 - 115                                |               |              |                |
| 1,2-Dichloroethane                   | 18.76  | 1.0                               | 20      | 0                     | 93.8 | 70 - 127                                |               |              |                |
| 1,2-Dichloropropane                  | 18.84  | 1.0                               | 20      | 0                     | 94.2 | 70 - 122                                |               |              |                |
| 1,3,5-Trimethylbenzene               | 16.37  | 1.0                               | 20      | 0                     | 81.8 | 70 - 126                                |               |              |                |
| 1,3-Dichlorobenzene                  | 16.81  | 1.0                               | 20      | 0                     | 84.0 | 70 - 119                                |               |              |                |
| 1,3-Dichloropropane                  | 17.43  | 1.0                               | 20      | 0                     | 87.2 | 70 - 121                                |               |              |                |
| 1,4-Dichlorobenzene                  | 16.86  | 1.0                               | 20      | 0                     | 84.3 | 70 - 114                                |               |              |                |
| 2,2-Dichloropropane                  | 20.2   | 1.0                               | 20      | 0                     | 101  | 70 - 130                                |               |              |                |
| 2-Butanone                           | 31.23  | 2.0                               | 40      | 0                     | 78.1 | 70 - 130                                |               |              |                |
| 2-Chlorotoluene                      | 18.33  | 1.0                               | 20      | 0                     | 91.6 | 70 - 130                                |               |              |                |
| 2-Hexanone                           | 30.33  | 2.0                               | 40      | 0                     | 75.8 | 70 - 130                                |               |              |                |
| 4-Chlorotoluene                      | 18.38  | 1.0                               | 20      | 0                     | 91.9 | 70 - 130                                |               |              |                |
| 4-Isopropyltoluene                   | 15.75  | 1.0                               | 20      | 0                     | 78.7 | 70 - 130                                |               |              |                |
| 4-Methyl-2-pentanone                 | 31.6   | 2.0                               | 40      | 0                     | 79.0 | 70 - 130                                |               |              |                |
| Acetone                              | 30.44  | 2.0                               | 40      | 0                     | 76.1 | 70 - 130                                |               |              |                |
| Benzene                              | 18.45  | 1.0                               | 20      | 0                     | 92.2 | 70 - 127                                |               |              |                |
| Bromobenzene                         | 16.68  | 1.0                               | 20      | 0                     | 83.4 | 70 - 115                                |               |              |                |
| Bromochloromethane                   | 18.1   | 1.0                               | 20      | 0                     | 90.5 | 70 - 127                                |               |              |                |
| Bromodichloromethane                 | 18.56  | 1.0                               | 20      | 0                     | 92.8 | 70 - 124                                |               |              |                |
| Bromoform                            | 15.83  | 1.0                               | 20      | 0                     | 79.1 | 70 - 129                                |               |              |                |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                |        | Instrument: VOA2                  |         | Method: SW8260        |      |   |               |              |                |
|----------------------------------|--------|-----------------------------------|---------|-----------------------|------|---|---------------|--------------|----------------|
| <b>MS</b>                        |        | Sample ID: <b>HS18101528-05MS</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 19:59</b> |               |              |                |
| Client ID: <b>67WW09A-181025</b> |        | Run ID: <b>VOA2_326668</b>        |         | SeqNo: <b>4801138</b> |      | PrepDate:                               |               | DF: <b>1</b> |                |
| Analyte                          | Result | PQL                               | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit Qual |
| Bromomethane                     | 22.59  | 1.0                               | 20      | 0                     | 113  | 70 - 130                                |               |              |                |
| Carbon disulfide                 | 36.82  | 2.0                               | 40      | 0                     | 92.0 | 70 - 130                                |               |              |                |
| Carbon tetrachloride             | 19.69  | 1.0                               | 20      | 0                     | 98.4 | 70 - 130                                |               |              |                |
| Chlorobenzene                    | 18.36  | 1.0                               | 20      | 0                     | 91.8 | 70 - 114                                |               |              |                |
| Chloroethane                     | 19.75  | 1.0                               | 20      | 0                     | 98.7 | 70 - 130                                |               |              |                |
| Chloroform                       | 18.04  | 1.0                               | 20      | 0                     | 90.2 | 70 - 125                                |               |              |                |
| Chloromethane                    | 17.8   | 1.0                               | 20      | 0                     | 89.0 | 70 - 130                                |               |              |                |
| cis-1,2-Dichloroethene           | 18.22  | 1.0                               | 20      | 0                     | 91.1 | 70 - 128                                |               |              |                |
| cis-1,3-Dichloropropene          | 18.87  | 1.0                               | 20      | 0                     | 94.3 | 70 - 125                                |               |              |                |
| Dibromochloromethane             | 17.2   | 1.0                               | 20      | 0                     | 86.0 | 70 - 124                                |               |              |                |
| Dibromomethane                   | 17.69  | 1.0                               | 20      | 0                     | 88.4 | 70 - 124                                |               |              |                |
| Dichlorodifluoromethane          | 19.14  | 1.0                               | 20      | 0                     | 95.7 | 70 - 130                                |               |              |                |
| Ethylbenzene                     | 19.73  | 1.0                               | 20      | 0                     | 98.7 | 70 - 124                                |               |              |                |
| Hexachlorobutadiene              | 17.09  | 1.0                               | 20      | 0                     | 85.5 | 70 - 130                                |               |              |                |
| Isopropylbenzene                 | 18.16  | 1.0                               | 20      | 0                     | 90.8 | 70 - 130                                |               |              |                |
| m,p-Xylene                       | 39.23  | 2.0                               | 40      | 0                     | 98.1 | 70 - 130                                |               |              |                |
| Methylene chloride               | 18.09  | 2.0                               | 20      | 0                     | 90.4 | 70 - 128                                |               |              |                |
| Naphthalene                      | 11.47  | 1.0                               | 20      | 0                     | 57.4 | 70 - 130                                |               |              | S              |
| n-Butylbenzene                   | 18.09  | 1.0                               | 20      | 0                     | 90.4 | 70 - 130                                |               |              |                |
| n-Propylbenzene                  | 18.87  | 1.0                               | 20      | 0                     | 94.4 | 70 - 130                                |               |              |                |
| o-Xylene                         | 18.65  | 1.0                               | 20      | 0                     | 93.3 | 70 - 124                                |               |              |                |
| sec-Butylbenzene                 | 16.82  | 1.0                               | 20      | 0                     | 84.1 | 70 - 130                                |               |              |                |
| Styrene                          | 17.42  | 1.0                               | 20      | 0                     | 87.1 | 70 - 130                                |               |              |                |
| tert-Butylbenzene                | 18.78  | 1.0                               | 20      | 0                     | 93.9 | 70 - 130                                |               |              |                |
| Tetrachloroethene                | 18.51  | 1.0                               | 20      | 0                     | 92.5 | 70 - 130                                |               |              |                |
| Toluene                          | 17.95  | 1.0                               | 20      | 0                     | 89.8 | 70 - 123                                |               |              |                |
| trans-1,2-Dichloroethene         | 19.51  | 1.0                               | 20      | 0                     | 97.5 | 70 - 130                                |               |              |                |
| trans-1,3-Dichloropropene        | 18.84  | 1.0                               | 20      | 0                     | 94.2 | 70 - 121                                |               |              |                |
| Trichloroethene                  | 18.45  | 1.0                               | 20      | 0                     | 92.3 | 70 - 129                                |               |              |                |
| Trichlorofluoromethane           | 20.46  | 1.0                               | 20      | 0                     | 102  | 70 - 130                                |               |              |                |
| Vinyl chloride                   | 20.94  | 1.0                               | 20      | 0                     | 105  | 70 - 130                                |               |              |                |
| Surr: 1,2-Dichloroethane-d4      | 49.72  | 1.0                               | 50      | 0                     | 99.4 | 70 - 126                                |               |              |                |
| Surr: 4-Bromofluorobenzene       | 50.93  | 1.0                               | 50      | 0                     | 102  | 81 - 113                                |               |              |                |
| Surr: Dibromofluoromethane       | 48.82  | 1.0                               | 50      | 0                     | 97.6 | 77 - 123                                |               |              |                |

ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

**QC BATCH REPORT**

| Batch ID: R326668                       |        | Instrument: VOA2                  |         | Method: SW8260             |                 |
|---|--------|-----------------------------------|---------|----------------------------|-----------------|
| <b>MS</b>                               |        | Sample ID: <b>HS18101528-05MS</b> |         | Units: <b>ug/L</b>         |                 |
| Analysis Date: <b>01-Nov-2018 19:59</b> |        | Client ID: <b>67WW09A-181025</b>  |         | Run ID: <b>VOA2_326668</b> |                 |
| SeqNo: <b>4801138</b>                   |        | PrepDate:                         |         | DF: <b>1</b>               |                 |
| Analyte                                 | Result | PQL                               | SPK Val | SPK Ref Value              | %REC            |
|   |        |                                   |         | Control Limit              | RPD Ref Value   |
|   |        |                                   |         |                            | %RPD            |
|   |        |                                   |         |                            | RPD Limit Qual  |
| Surr: Toluene-d8                        |        | 45.33                             | 1.0     | 50                         | 0 90.7 82 - 127 |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                    |        | Instrument: VOA2                   |         | Method: SW8260        |      |   |               |              |                |
|--------------------------------------|--------|------------------------------------|---------|-----------------------|------|---|---------------|--------------|----------------|
| <b>MSD</b>                           |        | Sample ID: <b>HS18101528-05MSD</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 20:23</b> |               |              |                |
| Client ID: <b>67WW09A-181025</b>     |        | Run ID: <b>VOA2_326668</b>         |         | SeqNo: <b>4801139</b> |      | PrepDate:                               |               | DF: <b>1</b> |                |
| Analyte                              | Result | PQL                                | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 17.99  | 1.0                                | 20      | 0                     | 89.9 | 70 - 120                                | 18.03         | 0.262        | 20             |
| 1,1,1-Trichloroethane                | 17.57  | 1.0                                | 20      | 0                     | 87.8 | 70 - 130                                | 18.22         | 3.64         | 20             |
| 1,1,2,2-Tetrachloroethane            | 15.64  | 1.0                                | 20      | 0                     | 78.2 | 70 - 123                                | 14.6          | 6.88         | 20             |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 20.42  | 1.0                                | 20      | 0                     | 102  | 70 - 130                                | 22.36         | 9.07         | 20             |
| 1,1,2-Trichloroethane                | 17.71  | 1.0                                | 20      | 0                     | 88.6 | 70 - 117                                | 16.98         | 4.21         | 20             |
| 1,1-Dichloroethane                   | 18.45  | 1.0                                | 20      | 0                     | 92.2 | 70 - 127                                | 18.87         | 2.28         | 20             |
| 1,1-Dichloroethene                   | 17.86  | 1.0                                | 20      | 0                     | 89.3 | 70 - 130                                | 18.51         | 3.62         | 20             |
| 1,1-Dichloropropene                  | 19.4   | 1.0                                | 20      | 0                     | 97.0 | 70 - 129                                | 20.47         | 5.38         | 20             |
| 1,2,3-Trichlorobenzene               | 14.78  | 1.0                                | 20      | 0                     | 73.9 | 70 - 130                                | 13.68         | 7.78         | 20             |
| 1,2,3-Trichloropropane               | 15.53  | 1.0                                | 20      | 0                     | 77.7 | 70 - 130                                | 14.43         | 7.37         | 20             |
| 1,2,4-Trichlorobenzene               | 15.8   | 1.0                                | 20      | 0                     | 79.0 | 70 - 125                                | 15.03         | 5            | 20             |
| 1,2,4-Trimethylbenzene               | 17.92  | 1.0                                | 20      | 0                     | 89.6 | 70 - 125                                | 17.72         | 1.08         | 20             |
| 1,2-Dibromo-3-chloropropane          | 14.95  | 1.0                                | 20      | 0                     | 74.7 | 70 - 130                                | 13.37         | 11.1         | 20             |
| 1,2-Dibromoethane                    | 17.61  | 1.0                                | 20      | 0                     | 88.1 | 70 - 124                                | 17.62         | 0.0605       | 20             |
| 1,2-Dichlorobenzene                  | 17.22  | 1.0                                | 20      | 0                     | 86.1 | 70 - 115                                | 16.57         | 3.85         | 20             |
| 1,2-Dichloroethane                   | 18.54  | 1.0                                | 20      | 0                     | 92.7 | 70 - 127                                | 18.76         | 1.16         | 20             |
| 1,2-Dichloropropane                  | 18.85  | 1.0                                | 20      | 0                     | 94.3 | 70 - 122                                | 18.84         | 0.0698       | 20             |
| 1,3,5-Trimethylbenzene               | 16.45  | 1.0                                | 20      | 0                     | 82.3 | 70 - 126                                | 16.37         | 0.507        | 20             |
| 1,3-Dichlorobenzene                  | 17.24  | 1.0                                | 20      | 0                     | 86.2 | 70 - 119                                | 16.81         | 2.53         | 20             |
| 1,3-Dichloropropane                  | 17.96  | 1.0                                | 20      | 0                     | 89.8 | 70 - 121                                | 17.43         | 2.98         | 20             |
| 1,4-Dichlorobenzene                  | 17.45  | 1.0                                | 20      | 0                     | 87.2 | 70 - 114                                | 16.86         | 3.42         | 20             |
| 2,2-Dichloropropane                  | 19.35  | 1.0                                | 20      | 0                     | 96.8 | 70 - 130                                | 20.2          | 4.29         | 20             |
| 2-Butanone                           | 33.2   | 2.0                                | 40      | 0                     | 83.0 | 70 - 130                                | 31.23         | 6.12         | 20             |
| 2-Chlorotoluene                      | 18.57  | 1.0                                | 20      | 0                     | 92.8 | 70 - 130                                | 18.33         | 1.28         | 20             |
| 2-Hexanone                           | 33.67  | 2.0                                | 40      | 0                     | 84.2 | 70 - 130                                | 30.33         | 10.4         | 20             |
| 4-Chlorotoluene                      | 18.8   | 1.0                                | 20      | 0                     | 94.0 | 70 - 130                                | 18.38         | 2.28         | 20             |
| 4-Isopropyltoluene                   | 15.54  | 1.0                                | 20      | 0                     | 77.7 | 70 - 130                                | 15.75         | 1.33         | 20             |
| 4-Methyl-2-pentanone                 | 34.99  | 2.0                                | 40      | 0                     | 87.5 | 70 - 130                                | 31.6          | 10.2         | 20             |
| Acetone                              | 33.38  | 2.0                                | 40      | 0                     | 83.4 | 70 - 130                                | 30.44         | 9.19         | 20             |
| Benzene                              | 18.21  | 1.0                                | 20      | 0                     | 91.1 | 70 - 127                                | 18.45         | 1.3          | 20             |
| Bromobenzene                         | 17.18  | 1.0                                | 20      | 0                     | 85.9 | 70 - 115                                | 16.68         | 2.94         | 20             |
| Bromochloromethane                   | 18.17  | 1.0                                | 20      | 0                     | 90.9 | 70 - 127                                | 18.1          | 0.392        | 20             |
| Bromodichloromethane                 | 18.56  | 1.0                                | 20      | 0                     | 92.8 | 70 - 124                                | 18.56         | 0.0378       | 20             |
| Bromoform                            | 17.17  | 1.0                                | 20      | 0                     | 85.9 | 70 - 129                                | 15.83         | 8.14         | 20             |

## ALS Houston, US

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

## QC BATCH REPORT

| Batch ID: R326668                |        | Instrument: VOA2                   |         | Method: SW8260        |      |   |               |              |                |
|----------------------------------|--------|------------------------------------|---------|-----------------------|------|---|---------------|--------------|----------------|
| <b>MSD</b>                       |        | Sample ID: <b>HS18101528-05MSD</b> |         | Units: <b>ug/L</b>    |      | Analysis Date: <b>01-Nov-2018 20:23</b> |               |              |                |
| Client ID: <b>67WW09A-181025</b> |        | Run ID: <b>VOA2_326668</b>         |         | SeqNo: <b>4801139</b> |      | PrepDate:                               |               | DF: <b>1</b> |                |
| Analyte                          | Result | PQL                                | SPK Val | SPK Ref Value         | %REC | Control Limit                           | RPD Ref Value | %RPD         | RPD Limit Qual |
| Bromomethane                     | 20.15  | 1.0                                | 20      | 0                     | 101  | 70 - 130                                | 22.59         | 11.4         | 20             |
| Carbon disulfide                 | 35.5   | 2.0                                | 40      | 0                     | 88.7 | 70 - 130                                | 36.82         | 3.65         | 20             |
| Carbon tetrachloride             | 19.24  | 1.0                                | 20      | 0                     | 96.2 | 70 - 130                                | 19.69         | 2.32         | 20             |
| Chlorobenzene                    | 18.04  | 1.0                                | 20      | 0                     | 90.2 | 70 - 114                                | 18.36         | 1.76         | 20             |
| Chloroethane                     | 18.33  | 1.0                                | 20      | 0                     | 91.7 | 70 - 130                                | 19.75         | 7.43         | 20             |
| Chloroform                       | 17.42  | 1.0                                | 20      | 0                     | 87.1 | 70 - 125                                | 18.04         | 3.48         | 20             |
| Chloromethane                    | 16.61  | 1.0                                | 20      | 0                     | 83.1 | 70 - 130                                | 17.8          | 6.93         | 20             |
| cis-1,2-Dichloroethene           | 18.05  | 1.0                                | 20      | 0                     | 90.3 | 70 - 128                                | 18.22         | 0.905        | 20             |
| cis-1,3-Dichloropropene          | 19.54  | 1.0                                | 20      | 0                     | 97.7 | 70 - 125                                | 18.87         | 3.5          | 20             |
| Dibromochloromethane             | 17.66  | 1.0                                | 20      | 0                     | 88.3 | 70 - 124                                | 17.2          | 2.66         | 20             |
| Dibromomethane                   | 18.55  | 1.0                                | 20      | 0                     | 92.8 | 70 - 124                                | 17.69         | 4.79         | 20             |
| Dichlorodifluoromethane          | 17.68  | 1.0                                | 20      | 0                     | 88.4 | 70 - 130                                | 19.14         | 7.92         | 20             |
| Ethylbenzene                     | 19.46  | 1.0                                | 20      | 0                     | 97.3 | 70 - 124                                | 19.73         | 1.4          | 20             |
| Hexachlorobutadiene              | 17.05  | 1.0                                | 20      | 0                     | 85.2 | 70 - 130                                | 17.09         | 0.244        | 20             |
| Isopropylbenzene                 | 17.81  | 1.0                                | 20      | 0                     | 89.1 | 70 - 130                                | 18.16         | 1.96         | 20             |
| m,p-Xylene                       | 38.92  | 2.0                                | 40      | 0                     | 97.3 | 70 - 130                                | 39.23         | 0.792        | 20             |
| Methylene chloride               | 17.26  | 2.0                                | 20      | 0                     | 86.3 | 70 - 128                                | 18.09         | 4.68         | 20             |
| Naphthalene                      | 13.08  | 1.0                                | 20      | 0                     | 65.4 | 70 - 130                                | 11.47         | 13.1         | 20 S           |
| n-Butylbenzene                   | 18.05  | 1.0                                | 20      | 0                     | 90.2 | 70 - 130                                | 18.09         | 0.238        | 20             |
| n-Propylbenzene                  | 18.92  | 1.0                                | 20      | 0                     | 94.6 | 70 - 130                                | 18.87         | 0.228        | 20             |
| o-Xylene                         | 18.86  | 1.0                                | 20      | 0                     | 94.3 | 70 - 124                                | 18.65         | 1.1          | 20             |
| sec-Butylbenzene                 | 16.42  | 1.0                                | 20      | 0                     | 82.1 | 70 - 130                                | 16.82         | 2.46         | 20             |
| Styrene                          | 17.65  | 1.0                                | 20      | 0                     | 88.2 | 70 - 130                                | 17.42         | 1.29         | 20             |
| tert-Butylbenzene                | 18.22  | 1.0                                | 20      | 0                     | 91.1 | 70 - 130                                | 18.78         | 3.05         | 20             |
| Tetrachloroethene                | 17.78  | 1.0                                | 20      | 0                     | 88.9 | 70 - 130                                | 18.51         | 4.03         | 20             |
| Toluene                          | 17.85  | 1.0                                | 20      | 0                     | 89.3 | 70 - 123                                | 17.95         | 0.557        | 20             |
| trans-1,2-Dichloroethene         | 18.79  | 1.0                                | 20      | 0                     | 94.0 | 70 - 130                                | 19.51         | 3.72         | 20             |
| trans-1,3-Dichloropropene        | 19.47  | 1.0                                | 20      | 0                     | 97.4 | 70 - 121                                | 18.84         | 3.27         | 20             |
| Trichloroethene                  | 17.73  | 1.0                                | 20      | 0                     | 88.6 | 70 - 129                                | 18.45         | 3.99         | 20             |
| Trichlorofluoromethane           | 19.95  | 1.0                                | 20      | 0                     | 99.7 | 70 - 130                                | 20.46         | 2.51         | 20             |
| Vinyl chloride                   | 19     | 1.0                                | 20      | 0                     | 95.0 | 70 - 130                                | 20.94         | 9.74         | 20             |
| Surr: 1,2-Dichloroethane-d4      | 49.69  | 1.0                                | 50      | 0                     | 99.4 | 70 - 126                                | 49.72         | 0.0698       | 20             |
| Surr: 4-Bromofluorobenzene       | 51.14  | 1.0                                | 50      | 0                     | 102  | 81 - 113                                | 50.93         | 0.398        | 20             |
| Surr: Dibromofluoromethane       | 48.29  | 1.0                                | 50      | 0                     | 96.6 | 77 - 123                                | 48.82         | 1.08         | 20             |

ALS Houston, US

Date: 02-Nov-18

Client: Aptim Environmental &amp; Infrastructure, Inc.

Project: Longhorn Army Ammunition Plant

WorkOrder: HS18101528

## QC BATCH REPORT

| Batch ID: R326668         |        | Instrument: VOA2            |         | Method: SW8260 |      |                                  |               |       |                |
|---------------------------|--------|-----------------------------|---------|----------------|------|----------------------------------|---------------|-------|----------------|
| MSD                       |        | Sample ID: HS18101528-05MSD |         | Units: ug/L    |      | Analysis Date: 01-Nov-2018 20:23 |               |       |                |
| Client ID: 67WW09A-181025 |        | Run ID: VOA2_326668         |         | SeqNo: 4801139 |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                   | Result | PQL                         | SPK Val | SPK Ref Value  | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Surr: Toluene-d8          | 45.62  | 1.0                         | 50      | 0              | 91.2 | 82 - 127                         | 45.33         | 0.633 | 20             |

The following samples were analyzed in this batch:

|               |               |               |               |
|---------------|---------------|---------------|---------------|
| HS18101528-01 | HS18101528-02 | HS18101528-03 | HS18101528-04 |
| HS18101528-05 | HS18101528-06 | HS18101528-07 |               |



**ALS Houston, US**

Date: 02-Nov-18

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant  
**WorkOrder:** HS18101528

**QUALIFIERS,  
ACRONYMS, UNITS**

| <b>Qualifier</b> | <b>Description</b>  |
|------------------|---|
| *                | Value exceeds Regulatory Limit  |
| a                | Not accredited  |
| B                | Analyte detected in the associated Method Blank above the Reporting Limit |
| E                | Value above quantitation range  |
| H                | Analyzed outside of Holding Time  |
| J                | Analyte detected below quantitation limit                                 |
| M                | Manually integrated, see raw data for justification                       |
| n                | Not offered for accreditation   |
| ND               | Not Detected at the Reporting Limit                                       |
| O                | Sample amount is > 4 times amount spiked                                  |
| P                | Dual Column results percent difference > 40%                              |
| R                | RPD above laboratory control limit  |
| S                | Spike Recovery outside laboratory control limits                          |
| U                | Analyzed but not detected above the MDL/SDL                               |

| <b>Acronym</b> | <b>Description</b>                  |
|----------------|-------------------------------------|
| DCS            | Detectability Check Study           |
| DUP            | Method Duplicate                    |
| LCS            | Laboratory Control Sample           |
| LCSD           | Laboratory Control Sample Duplicate |
| MBLK           | Method Blank                        |
| MDL            | Method Detection Limit              |
| MQL            | Method Quantitation Limit           |
| MS             | Matrix Spike                        |
| MSD            | Matrix Spike Duplicate              |
| PDS            | Post Digestion Spike                |
| PQL            | Practical Quantitation Limit        |
| SD             | Serial Dilution                     |
| SDL            | Sample Detection Limit              |
| TRRP           | Texas Risk Reduction Program        |

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**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

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| <b>Agency</b>   | <b>Number</b>     | <b>Expire Date</b> |
|-----------------|-------------------|--------------------|
| North Carolina  | 624-2018          | 31-Dec-2018        |
| Arkansas        | 88-0356           | 27-Mar-2019        |
| Texas           | T10470231-18-21   | 30-Apr-2019        |
| North Dakota    | R193 2018-2019    | 30-Apr-2019        |
| Illinois        | 004438            | 29-Jun-2019        |
| Louisiana       | 03087             | 30-Jun-2019        |
| Dept of Defense | ANAB L2231        | 22-Dec-2018        |
| Kentucky        | 123043 - 2018     | 30-Apr-2019        |
| Kansas          | E-10352 2018-2019 | 31-Jul-2019        |
| Oklahoma        | 2018-156          | 31-Aug-2019        |

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ALS Houston, US

Date: 02-Nov-18

## Sample Receipt Checklist

Client Name: CBI-Houston  
 Work Order: HS18101528

Date/Time Received: **26-Oct-2018 08:45**  
 Received by: **PJM**

Checklist completed by: Paresh M. Giga 26-Oct-2018 Reviewed by: RJ Modashia 29-Oct-2018  
 eSignature Date eSignature Date

Matrices: **Groundwater/Water**Carrier name: **FedEx**

|   |   |                             |   |
|---|---|-----------------------------|---|
| Shipping container/cooler in good condition?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/>            |
| Custody seals intact on shipping container/cooler?      | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/>            |
| Custody seals intact on sample bottles?                 | Yes <input type="checkbox"/>            | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| Chain of custody agrees with sample labels?             | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| Samples in proper container/bottle?                     | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| Sample containers intact?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| TX1005 solids received in hermetically sealed vials?    | Yes <input type="checkbox"/>            | No <input type="checkbox"/> | N/A <input checked="" type="checkbox"/>         |
| Sufficient sample volume for indicated test?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| All samples received within holding time?               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |
| Container/Temp Blank temperature in compliance?         | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> |   |

|                                |               |      |
|--------------------------------|---------------|------|
| Temperature(s)/Thermometer(s): | 1.3c/0.9c U/C | IR11 |
|--------------------------------|---------------|------|

|                   |       |
|-------------------|-------|
| Cooler(s)/Kit(s): | 43656 |
|-------------------|-------|

|                                      |                |
|--------------------------------------|----------------|
| Date/Time sample(s) sent to storage: | 10/26/18 18:30 |
|--------------------------------------|----------------|

|  |   |                             |   |
|--|---|-----------------------------|---|
| Water - VOA vials have zero headspace? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input type="checkbox"/> |
|--|---|-----------------------------|---|

|                                     |                              |                             |   |
|-------------------------------------|------------------------------|-----------------------------|---|
| Water - pH acceptable upon receipt? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input checked="" type="checkbox"/> |
|-------------------------------------|------------------------------|-----------------------------|---|

|              |                              |                             |   |
|--------------|------------------------------|-----------------------------|---|
| pH adjusted? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | N/A <input checked="" type="checkbox"/> |
|--------------|------------------------------|-----------------------------|---|

|                 |  |
|-----------------|--|
| pH adjusted by: |  |
|-----------------|--|

Login Notes:

|                   |                 |                   |
|-------------------|-----------------|-------------------|
| Client Contacted: | Date Contacted: | Person Contacted: |
|-------------------|-----------------|-------------------|

|               |            |
|---------------|------------|
| Contacted By: | Regarding: |
|---------------|------------|

|           |  |
|-----------|--|
| Comments: |  |
|-----------|--|


|                    |  |
|--------------------|--|
| Corrective Action: |  |
|--------------------|--|

| <b>APTIM</b>   |          | Page 1 of _____                           |           |                   |  |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
|--|----------|---|-----------|-------------------|--|-------------|---------------------------|------------|------------------------------------|------------------------|-----------------------------------|--|---------------------------|------------------------|--------------------------------|----------------------------|----------------------|--------------------------------------|--|--|
| COC ID: 67-OCT2018-GW-ALSHT-1810                               |          | TURNAROUND TIME: normal                   |           |                   |  |             | RUSH:                     |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| <b>PROJECT/CLIENT INFO</b>                                     |          |   |           |                   |  |             | <b>LABORATORY</b>         |            |                                    | <b>OTHER INFO</b>      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Facility Name Longhorn AAP                                     |          | Lab Name ALS Laboratories                 |           |                   | Email Invoice To FedInvoices@C8IIFederalServices.com |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Project Number 501032  |          | Lab Contact RJ Modashia                   |           |                   |  |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| LHAAP-67   |          | Email RJ.Modashia@alsglobal.com           |           |                   | Email Report To Kim.napier@aptim.com                 |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Address 1203-B East Grand Avenue                               |          | Address 10450 Stancliff Rd., Suite 210    |           |                   | Mail Reports To Kim Napier                           |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| PMB 202  |          |   |           |                   | Address 2410 Cherahala Blvd.                         |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| City Marshall  |          | State TX                                  |           | City Houston      |  | State TX    |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Postal Code 75670  |          | Country USA                               |           | Postal Code 77099 |  | Country USA |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Phone Number 713.243.7264                                      |          | Phone Number 281.575.2279 or 281.530.5656 |           |                   | Postal Code 37932                                    |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Project Manager Praveen Srivastav                              |          |   |           |                   | Shipping Company                                     |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| <b>SAMPLE DETAILS</b>  |          |   |           |                   |  |             | <b>ANALYSIS REQUESTED</b> |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| Sample ID  | Location | Start Depth                               | End Depth | Depth Unit        | Field Matrix   | Date        | Time (24hr)               | # Of Cont. | ANALYSIS                           | VOCs in Water by 8260B | Carbon Dioxide in Water by RSK175 | Methane, Ethane, Ethene in Water by RSK175 | Anions in Water by E300.0 | TOC in Water by E415.1 | TIC in Water by E415.1         | Sulfide in Water by E376.1 | Alkalinity by E310.1 |                                      |  |  |
| 67WW05-181025  | LHAAP 67 | 25.80                                     | 26.07     |                   | WG   | 10/25/18    | 0930                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW05-181025-FD   | LHAAP 67 | 25.80                                     | 26.07     |                   | WG   | 10/25/18    | 0930                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW02-181025  | LHAAP 67 | 24.35                                     | 24.60     |                   | WG   | 10/25/18    | 1025                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW07-181025  | LHAAP 67 | 24.44                                     | 25.19     |                   | WG   | 10/25/18    | 1125                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW09A-181025   | LHAAP 67 | 27.02                                     | 27.26     |                   | WG   | 10/25/18    | 1225                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW09A-181025-MS  | LHAAP 67 | 27.02                                     | 27.26     |                   | WG   | 10/25/18    | 1225                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW09A-181025-MSD   | LHAAP 67 | 27.02                                     | 27.26     |                   | WG   | 10/25/18    | 1225                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| 67WW16I-181025   | LHAAP 67 | 24.03                                     | 24.22     |                   | WG   | 10/25/18    | 1320                      | 3          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| TRIP BLANK   |          |   |           |                   | W  | 10/25/18    |                           | 2          |                                    | X                      |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
| <b>ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS</b>                |          |   |           |                   |  |             |                           |            | <b>RELINQUISHED BY/AFFILIATION</b> |                        |                                   | <b>DATE/TIME</b>                           |                           |                        | <b>ACCEPTED BY/AFFILIATION</b> |                            |                      | <b>DATE/TIME</b>                     |  |  |
| Anions should include chloride, nitrate, nitrite, and sulfate. |          |   |           |                   |  |             |                           |            | Sue Blum / BHATC                   |                        |                                   | 10/25/18 1430                              |                           |                        | P.M. 10/26/18 0345             |                            |                      | Cooler 43656 TEMP 1-30 1/211 CF-0-46 |  |  |
|  |          |   |           |                   |  |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |
|  |          |   |           |                   |  |             |                           |            |                                    |                        |                                   |  |                           |                        |                                |                            |                      |                                      |  |  |

HS18101528

Aptim Environmental & Infrastructure, Inc.  
Longhorn Army Ammunition Plant



|   |   |  |  |
|---|---|--|--|
|  <b>ALS</b><br>10450 Stancliff Rd., Suite 210<br>Houston, Texas 77099<br>Tel. +1 281 530 5656<br>Fax. +1 281 530 5657 | <b>CUSTODY SEAL</b><br>Date: <u>10/25/18</u> Time: <u>1430</u><br>Name: <u>Scott Beesinger</u><br>Company: <u>BHATT</u> |  | Seal Broken By: <u>SM</u><br>Date: <u>10/26/18</u> |
|   | 43656   |  |  |

43656 OCT 26 2018



Must Deliver Next Business Day  
Time and Temperature Sensitive!

43656

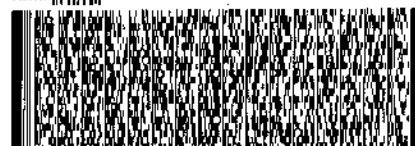
ORIGIN ID: SGRA (903) 930-6193  
 SCOTT BEESINGER  
 APTIN ENVIRONMENTAL & INFRASTRUCTURE  
 1203-B EAST GRAND AVE  
 PMB 202  
 MARSHALL, TX 75670  
 UNITED STATES US

SHIP DATE: 17OCT18  
 ACTWT: 1.00 LB HAN  
 CAD: 300130/CPE3211  
 DIMS: 26x14x14 IN

TO CLIENT SERVICES  
 ALS LABORATORY GROUP  
 10450 STANCLIFF ROAD  
 SUITE 210  
 HOUSTON TX 77099

(281) 530-5656  
 REF: LHAAP 67-RJ

RMA: ||| ||| |||



**FedEx**  
EXPRESS



**FedEx**  
TRK  
022-4380 9533 6780

FRI - 26 OCT 10:30A  
PRIORITY OVERNIGHT

**AB SGRA**

**77099**  
TX-LS  
IAH



FTD 162785 25OCT18 GGGA 55361/8866/ACBA



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10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887

May 17, 2019

Susan Huang  
Aptim Environmental & Infrastructure, Inc.  
2500 City West Blvd., Suite 1700  
Houston, TX 77042

Work Order: **HS19050082**

Laboratory Results for: **Longhorn Army Ammunition Plant LHAAP-67**

Dear Susan,

ALS Environmental received 7 sample(s) on May 02, 2019 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL

RJ Modashia  
Project Manager

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**Work Order:** HS19050082

## SAMPLE SUMMARY

| Lab Samp ID   | Client Sample ID | Matrix      | TagNo             | Collection Date   | Date Received     | Hold                     |
|---------------|------------------|-------------|-------------------|-------------------|-------------------|--------------------------|
| HS19050082-01 | 67WW13-190501    | Groundwater |                   | 01-May-2019 08:00 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-02 | 67WW13-190501 FD | Groundwater |                   | 01-May-2019 08:00 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-03 | 67WW08-190501    | Groundwater |                   | 01-May-2019 09:00 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-04 | 67WW11-190501    | Groundwater |                   | 01-May-2019 09:55 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-05 | 67WW16I-190501   | Groundwater |                   | 01-May-2019 10:45 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-06 | 67WW02-190501    | Groundwater |                   | 01-May-2019 11:35 | 02-May-2019 08:51 | <input type="checkbox"/> |
| HS19050082-07 | Trip Blank       | Water       | C&G<br>040119-201 | 01-May-2019 00:00 | 02-May-2019 08:51 | <input type="checkbox"/> |



**ALS Houston, US**

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**Work Order:**

**CASE NARRATIVE**

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**Work Order Comments**

- The analysis for Methane, Methene, Ethane and CO2 by RSK175 was subcontracted to ALS Simi Valley, CA. Final report attached.
- The analysis for TOC was subcontracted to ALS Kelso, WA. Final report attached.

---

**GCMS Volatiles by Method SW8260****Batch ID: R338352****Sample ID: VLCSW-190513**

- 1,2,3-Trichlorobenzene exceeded QC limits for LCS. CCV is OK. Samples are ND for this compound.

**Sample ID: 67WW11-190501 (HS19050082-04MS)**

- MS/MSD failed QC limits for some few compounds

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**WetChemistry by Method SW9056****Batch ID: R337814**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.
-

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW13-190501  
 Collection Date: 01-May-2019 08:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-01  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |             |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |             |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| <b>1,1,2-Trichloroethane</b>         | <b>3.9</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 19:21 |
| <b>1,1-Dichloroethane</b>            | <b>14</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 19:21 |
| <b>1,1-Dichloroethene</b>            | <b>200</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 19:21 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| <b>1,2-Dichloroethane</b>            | <b>24</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 19:21 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Acetone                              | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 19:21 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW13-190501  
 Collection Date: 01-May-2019 08:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-01  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL     | DL                   | LOD          | LOQ           | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|--|--------------|----------|----------------------|--------------|---------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b>  |              |          | <b>Method:SW8260</b> |              |               |             |                 | Analyst: PC       |
| Chloroform                                 | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Chloromethane                              | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| <b>cis-1,2-Dichloroethene</b>              | <b>0.94</b>  | <b>J</b> | <b>0.20</b>          | <b>0.50</b>  | <b>1.0</b>    | <b>UG/L</b> | <b>1</b>        | 13-May-2019 19:21 |
| cis-1,3-Dichloropropene                    | 0.50         | U        | 0.10                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Dibromochloromethane                       | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Dibromomethane                             | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Dichlorodifluoromethane                    | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Ethylbenzene                               | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Hexachlorobutadiene                        | 1.0          | U        | 1.0                  | 1.0          | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Isopropylbenzene                           | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| m,p-Xylene                                 | 1.0          | U        | 0.50                 | 1.0          | 2.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Methylene chloride                         | 1.0          | U        | 0.40                 | 1.0          | 2.0           | UG/L        | 1               | 13-May-2019 19:21 |
| n-Butylbenzene                             | 0.50         | U        | 0.40                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| n-Propylbenzene                            | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Naphthalene                                | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| o-Xylene                                   | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| sec-Butylbenzene                           | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Styrene                                    | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| tert-Butylbenzene                          | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Tetrachloroethene                          | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Toluene                                    | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| trans-1,2-Dichloroethene                   | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| trans-1,3-Dichloropropene                  | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| <b>Trichloroethene</b>                     | <b>1.1</b>   |          | <b>0.20</b>          | <b>0.50</b>  | <b>1.0</b>    | <b>UG/L</b> | <b>1</b>        | 13-May-2019 19:21 |
| Trichlorofluoromethane                     | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| Vinyl chloride                             | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 19:21 |
| <i>Surr: 1,2-Dichloroethane-d4</i>         | <i>86.8</i>  |          |                      | <b>0</b>     | <i>81-118</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 19:21 |
| <i>Surr: 4-Bromofluorobenzene</i>          | <i>98.3</i>  |          |                      | <b>0</b>     | <i>85-114</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 19:21 |
| <i>Surr: Dibromofluoromethane</i>          | <i>88.2</i>  |          |                      | <b>0</b>     | <i>80-119</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 19:21 |
| <i>Surr: Toluene-d8</i>                    | <i>105</i>   |          |                      | <b>0</b>     | <i>89-112</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 19:21 |
| <b>ANIONS BY SW9056A</b>                   |              |          | <b>Method:SW9056</b> |              |               |             |                 | Analyst: AJH      |
| <b>Chloride</b>                            | <b>1,240</b> |          | <b>10.0</b>          | <b>25.0</b>  | <b>25.0</b>   | <b>mg/L</b> | <b>50</b>       | 03-May-2019 04:45 |
| <b>Nitrogen, Nitrate (As N)</b>            | <b>0.697</b> |          | <b>0.150</b>         | <b>0.500</b> | <b>0.500</b>  | <b>mg/L</b> | <b>5</b>        | 03-May-2019 04:31 |
| <b>Sulfate</b>                             | <b>284</b>   |          | <b>10.0</b>          | <b>25.0</b>  | <b>25.0</b>   | <b>mg/L</b> | <b>50</b>       | 03-May-2019 04:45 |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              |          | <b>Method:NA</b>     |              |               |             |                 | Analyst: SUBCA    |
| Subcontract Analysis                       | See Attached |          | 0                    | 0            |               | NA          | 1               | 17-May-2019 15:08 |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              |          | <b>Method:NA</b>     |              |               |             |                 | Analyst: SUBK     |
| Subcontract Analysis                       | See Attached |          | 0                    | 0            |               | NA          | 1               | 14-May-2019 12:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW13-190501 FD  
 Collection Date: 01-May-2019 08:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-02  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| <b>1,1,2-Trichloroethane</b>              | <b>3.8</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 20:09 |
| <b>1,1-Dichloroethane</b>                 | <b>13</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 20:09 |
| <b>1,1-Dichloroethene</b>                 | <b>160</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 20:09 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| <b>1,2-Dichloroethane</b>                 | <b>23</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 20:09 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Acetone                                   | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 20:09 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW13-190501 FD  
 Collection Date: 01-May-2019 08:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-02  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL     | DL                   | LOD          | LOQ           | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|--|--------------|----------|----------------------|--------------|---------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b>  |              |          | <b>Method:SW8260</b> |              |               |             |                 | Analyst: PC       |
| Chloroform                                 | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Chloromethane                              | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| <b>cis-1,2-Dichloroethene</b>              | <b>0.81</b>  | <b>J</b> | <b>0.20</b>          | <b>0.50</b>  | <b>1.0</b>    | <b>UG/L</b> | <b>1</b>        | 13-May-2019 20:09 |
| cis-1,3-Dichloropropene                    | 0.50         | U        | 0.10                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Dibromochloromethane                       | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Dibromomethane                             | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Dichlorodifluoromethane                    | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Ethylbenzene                               | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Hexachlorobutadiene                        | 1.0          | U        | 1.0                  | 1.0          | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Isopropylbenzene                           | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| m,p-Xylene                                 | 1.0          | U        | 0.50                 | 1.0          | 2.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Methylene chloride                         | 1.0          | U        | 0.40                 | 1.0          | 2.0           | UG/L        | 1               | 13-May-2019 20:09 |
| n-Butylbenzene                             | 0.50         | U        | 0.40                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| n-Propylbenzene                            | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Naphthalene                                | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| o-Xylene                                   | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| sec-Butylbenzene                           | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Styrene                                    | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| tert-Butylbenzene                          | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Tetrachloroethene                          | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Toluene                                    | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| trans-1,2-Dichloroethene                   | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| trans-1,3-Dichloropropene                  | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| <b>Trichloroethene</b>                     | <b>1.00</b>  | <b>J</b> | <b>0.20</b>          | <b>0.50</b>  | <b>1.0</b>    | <b>UG/L</b> | <b>1</b>        | 13-May-2019 20:09 |
| Trichlorofluoromethane                     | 0.50         | U        | 0.30                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| Vinyl chloride                             | 0.50         | U        | 0.20                 | 0.50         | 1.0           | UG/L        | 1               | 13-May-2019 20:09 |
| <i>Surr: 1,2-Dichloroethane-d4</i>         | <i>86.5</i>  |          |                      | <b>0</b>     | <i>81-118</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 20:09 |
| <i>Surr: 4-Bromofluorobenzene</i>          | <i>100</i>   |          |                      | <b>0</b>     | <i>85-114</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 20:09 |
| <i>Surr: Dibromofluoromethane</i>          | <i>89.7</i>  |          |                      | <b>0</b>     | <i>80-119</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 20:09 |
| <i>Surr: Toluene-d8</i>                    | <i>104</i>   |          |                      | <b>0</b>     | <i>89-112</i> | <b>%REC</b> | <b>1</b>        | 13-May-2019 20:09 |
| <b>ANIONS BY SW9056A</b>                   |              |          | <b>Method:SW9056</b> |              |               |             |                 | Analyst: AJH      |
| <b>Chloride</b>                            | <b>1,300</b> |          | <b>10.0</b>          | <b>25.0</b>  | <b>25.0</b>   | <b>mg/L</b> | <b>50</b>       | 03-May-2019 05:14 |
| <b>Nitrogen, Nitrate (As N)</b>            | <b>0.657</b> |          | <b>0.150</b>         | <b>0.500</b> | <b>0.500</b>  | <b>mg/L</b> | <b>5</b>        | 03-May-2019 05:00 |
| <b>Sulfate</b>                             | <b>318</b>   |          | <b>1.00</b>          | <b>2.50</b>  | <b>2.50</b>   | <b>mg/L</b> | <b>5</b>        | 03-May-2019 05:00 |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              |          | <b>Method:NA</b>     |              |               |             |                 | Analyst: SUBCA    |
| Subcontract Analysis                       | See Attached |          | 0                    | 0            |               | NA          | 1               | 17-May-2019 15:08 |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              |          | <b>Method:NA</b>     |              |               |             |                 | Analyst: SUBK     |
| Subcontract Analysis                       | See Attached |          | 0                    | 0            |               | NA          | 1               | 14-May-2019 12:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW08-190501  
 Collection Date: 01-May-2019 09:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-03  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |             |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |             |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| <b>1,1-Dichloroethane</b>            | <b>7.5</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 20:57 |
| <b>1,1-Dichloroethene</b>            | <b>110</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 20:57 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| <b>1,2-Dichloroethane</b>            | <b>5.1</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 20:57 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Acetone                              | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 13-May-2019 20:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW08-190501  
 Collection Date: 01-May-2019 09:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-03  
 Matrix:Groundwater

| ANALYSES                                   | RESULT       | QUAL | DL                   | LOD         | LOQ           | UNITS       | DILUTION FACTOR | DATE ANALYZED            |
|--|--------------|------|----------------------|-------------|---------------|-------------|-----------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b>  |              |      | <b>Method:SW8260</b> |             |               |             |                 | Analyst: PC              |
| Chloroform                                 | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Chloromethane                              | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| cis-1,2-Dichloroethene                     | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| cis-1,3-Dichloropropene                    | 0.50         | U    | 0.10                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Dibromochloromethane                       | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Dibromomethane                             | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Dichlorodifluoromethane                    | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Ethylbenzene                               | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Hexachlorobutadiene                        | 1.0          | U    | 1.0                  | 1.0         | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Isopropylbenzene                           | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| m,p-Xylene                                 | 1.0          | U    | 0.50                 | 1.0         | 2.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Methylene chloride                         | 1.0          | U    | 0.40                 | 1.0         | 2.0           | UG/L        | 1               | 13-May-2019 20:57        |
| n-Butylbenzene                             | 0.50         | U    | 0.40                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| n-Propylbenzene                            | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Naphthalene                                | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| o-Xylene                                   | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| sec-Butylbenzene                           | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Styrene                                    | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| tert-Butylbenzene                          | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Tetrachloroethene                          | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Toluene                                    | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| trans-1,2-Dichloroethene                   | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| trans-1,3-Dichloropropene                  | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Trichloroethene                            | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Trichlorofluoromethane                     | 0.50         | U    | 0.30                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| Vinyl chloride                             | 0.50         | U    | 0.20                 | 0.50        | 1.0           | UG/L        | 1               | 13-May-2019 20:57        |
| <i>Surr: 1,2-Dichloroethane-d4</i>         | <i>87.0</i>  |      |                      | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <b>1</b>        | <i>13-May-2019 20:57</i> |
| <i>Surr: 4-Bromofluorobenzene</i>          | <i>98.3</i>  |      |                      | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <b>1</b>        | <i>13-May-2019 20:57</i> |
| <i>Surr: Dibromofluoromethane</i>          | <i>88.7</i>  |      |                      | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <b>1</b>        | <i>13-May-2019 20:57</i> |
| <i>Surr: Toluene-d8</i>                    | <i>107</i>   |      |                      | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <b>1</b>        | <i>13-May-2019 20:57</i> |
| <b>ANIONS BY SW9056A</b>                   |              |      | <b>Method:SW9056</b> |             |               |             |                 | Analyst: AJH             |
| <b>Chloride</b>                            | <b>1,680</b> |      | <b>10.0</b>          | <b>25.0</b> | <b>25.0</b>   | <b>mg/L</b> | <b>50</b>       | <b>03-May-2019 06:13</b> |
| Nitrogen, Nitrate (As N)                   | 0.500        | U    | 0.150                | 0.500       | 0.500         | mg/L        | 5               | 03-May-2019 05:29        |
| <b>Sulfate</b>                             | <b>479</b>   |      | <b>1.00</b>          | <b>2.50</b> | <b>2.50</b>   | <b>mg/L</b> | <b>5</b>        | <b>03-May-2019 05:29</b> |
| <b>SUBCONTRACT ANALYSIS - RSK</b>          |              |      | <b>Method:NA</b>     |             |               |             |                 | Analyst: SUBCA           |
| Subcontract Analysis                       | See Attached |      | 0                    | 0           |               | NA          | 1               | 17-May-2019 15:08        |
| <b>SUBCONTRACT ANALYSIS - TOC ANALYSIS</b> |              |      | <b>Method:NA</b>     |             |               |             |                 | Analyst: SUBK            |
| Subcontract Analysis                       | See Attached |      | 0                    | 0           |               | NA          | 1               | 14-May-2019 12:57        |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW11-190501  
 Collection Date: 01-May-2019 09:55

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-04  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,1,2-Trichloroethane                     | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| <b>1,1-Dichloroethane</b>                 | <b>1.9</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 18:32 |
| <b>1,1-Dichloroethene</b>                 | <b>2.8</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 18:32 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2-Dichloroethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 18:32 |
| <b>Acetone</b>                            | <b>5.6</b> |                      | <b>0.40</b> | <b>1.0</b>  | <b>2.0</b> | <b>UG/L</b> | 1               | 13-May-2019 18:32 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 18:32 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW11-190501  
 Collection Date: 01-May-2019 09:55

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-04  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:32        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>87.0</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 18:32</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.5</i> |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 18:32</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>88.6</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 18:32</i> |
| <i>Surr: Toluene-d8</i>             | <i>104</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 18:32</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW16I-190501  
 Collection Date: 01-May-2019 10:45

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-05  
 Matrix:Groundwater

| ANALYSES                             | RESULT      | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|-------------|----------------------|-------------|------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |             | <b>Method:SW8260</b> |             |            |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |             |                      |             |            |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1,1-Trichloroethane                | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1,2,2-Tetrachloroethane            | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1,2-Trichloroethane                | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1-Dichloroethane                   | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1-Dichloroethene                   | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,1-Dichloropropene                  | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2,3-Trichlorobenzene               | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2,3-Trichloropropane               | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2,4-Trichlorobenzene               | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2,4-Trimethylbenzene               | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2-Dibromo-3-chloropropane          | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2-Dibromoethane                    | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2-Dichlorobenzene                  | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2-Dichloroethane                   | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,2-Dichloropropane                  | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,3,5-Trimethylbenzene               | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,3-Dichlorobenzene                  | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,3-Dichloropropane                  | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 1,4-Dichlorobenzene                  | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 2,2-Dichloropropane                  | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 2-Butanone                           | 1.0         | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 2-Chlorotoluene                      | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 2-Hexanone                           | 1.0         | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 4-Chlorotoluene                      | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 4-Isopropyltoluene                   | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| 4-Methyl-2-pentanone                 | 1.0         | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| <b>Acetone</b>                       | <b>3.3</b>  |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 18:57 |
| Benzene                              | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Bromobenzene                         | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Bromochloromethane                   | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Bromodichloromethane                 | 0.50        | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Bromoform                            | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Bromomethane                         | 0.50        | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| <b>Carbon disulfide</b>              | <b>0.90</b> | <b>J</b>             | <b>0.60</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 13-May-2019 18:57 |
| Carbon tetrachloride                 | 0.50        | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Chlorobenzene                        | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |
| Chloroethane                         | 0.50        | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 13-May-2019 18:57 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW16I-190501  
 Collection Date: 01-May-2019 10:45

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-05  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:57        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.2</i> |                      |      | <b>0</b> | <i>81-118</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:57</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>97.7</i> |                      |      | <b>0</b> | <i>85-114</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:57</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>89.8</i> |                      |      | <b>0</b> | <i>80-119</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:57</i> |
| <i>Surr: Toluene-d8</i>             | <i>105</i>  |                      |      | <b>0</b> | <i>89-112</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:57</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW02-190501  
 Collection Date: 01-May-2019 11:35

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-06  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| <b>1,1,2-Trichloroethane</b>              | <b>1.2</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 21:21 |
| <b>1,1-Dichloroethane</b>                 | <b>8.4</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 21:21 |
| <b>1,1-Dichloroethene</b>                 | <b>180</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 21:21 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| <b>1,2-Dichloroethane</b>                 | <b>4.7</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 13-May-2019 21:21 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Acetone                                   | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 13-May-2019 21:21 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW02-190501  
 Collection Date: 01-May-2019 11:35

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-06  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL          | LOD         | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|-------------|-------------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |             |             |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |             |             |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Chloromethane                       | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Dibromochloromethane                | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Dibromomethane                      | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Ethylbenzene                        | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0         | 1.0         | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| m,p-Xylene                          | 1.0         | U                    | 0.50        | 1.0         | 2.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Methylene chloride                  | 1.0         | U                    | 0.40        | 1.0         | 2.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Naphthalene                         | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| o-Xylene                            | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Styrene                             | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Toluene                             | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| <b>Trichloroethene</b>              | <b>0.87</b> | <b>J</b>             | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | <b>1</b>           | <b>13-May-2019 21:21</b> |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| Vinyl chloride                      | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 13-May-2019 21:21        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.4</i> |                      |             | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 21:21</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>97.6</i> |                      |             | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 21:21</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>87.9</i> |                      |             | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 21:21</i> |
| <i>Surr: Toluene-d8</i>             | <i>106</i>  |                      |             | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>13-May-2019 21:21</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: Trip Blank  
 Collection Date: 01-May-2019 00:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-07  
 Matrix:Water

| ANALYSES                             | RESULT | QUAL                 | DL   | LOD  | LOQ | UNITS | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|--------|----------------------|------|------|-----|-------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |        | <b>Method:SW8260</b> |      |      |     |       |                    | Analyst: PC       |
| <b>8260C</b>                         |        |                      |      |      |     |       |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1,1-Trichloroethane                | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1,2,2-Tetrachloroethane            | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1,2-Trichloroethane                | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1-Dichloroethane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1-Dichloroethene                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,1-Dichloropropene                  | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2,3-Trichlorobenzene               | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2,3-Trichloropropane               | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2,4-Trichlorobenzene               | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2,4-Trimethylbenzene               | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2-Dibromo-3-chloropropane          | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2-Dibromoethane                    | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2-Dichlorobenzene                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2-Dichloroethane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,2-Dichloropropane                  | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,3,5-Trimethylbenzene               | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,3-Dichlorobenzene                  | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,3-Dichloropropane                  | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 1,4-Dichlorobenzene                  | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 2,2-Dichloropropane                  | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 2-Butanone                           | 1.0    | U                    | 0.50 | 1.0  | 2.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 2-Chlorotoluene                      | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 2-Hexanone                           | 1.0    | U                    | 1.0  | 1.0  | 2.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 4-Chlorotoluene                      | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 4-Isopropyltoluene                   | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| 4-Methyl-2-pentanone                 | 1.0    | U                    | 0.70 | 1.0  | 2.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Acetone                              | 1.0    | U                    | 0.40 | 1.0  | 2.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Benzene                              | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Bromobenzene                         | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Bromochloromethane                   | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Bromodichloromethane                 | 0.50   | U                    | 0.20 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Bromoform                            | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Bromomethane                         | 0.50   | U                    | 0.40 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Carbon disulfide                     | 1.0    | U                    | 0.60 | 1.0  | 2.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Carbon tetrachloride                 | 0.50   | U                    | 0.50 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Chlorobenzene                        | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |
| Chloroethane                         | 0.50   | U                    | 0.30 | 0.50 | 1.0 | UG/L  | 1                  | 13-May-2019 18:08 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 17-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: Trip Blank  
 Collection Date: 01-May-2019 00:00

## ANALYTICAL REPORT

WorkOrder:HS19050082  
 Lab ID:HS19050082-07  
 Matrix:Water

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 13-May-2019 18:08        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.3</i> |                      |      | <b>0</b> | <i>81-118</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:08</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.3</i> |                      |      | <b>0</b> | <i>85-114</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:08</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>88.4</i> |                      |      | <b>0</b> | <i>80-119</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:08</i> |
| <i>Surr: Toluene-d8</i>             | <i>105</i>  |                      |      | <b>0</b> | <i>89-112</i> | <i>%REC</i> | <i>1</i>           | <i>13-May-2019 18:08</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**DATES REPORT**

| Sample ID               | Client Samp ID   | Collection Date   | TCLP Date | Prep Date                  | Analysis Date     | DF |
|-------------------------|--|-------------------|-----------|----------------------------|-------------------|----|
| <b>Batch ID</b> R337814 | <b>Test Name :</b> ANIONS BY SW9056A                   |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS19050082-01           | 67WW13-190501  | 01 May 2019 08:00 |           |                            | 03 May 2019 04:45 | 50 |
| HS19050082-01           | 67WW13-190501  | 01 May 2019 08:00 |           |                            | 03 May 2019 04:31 | 5  |
| HS19050082-02           | 67WW13-190501 FD                                       | 01 May 2019 08:00 |           |                            | 03 May 2019 05:14 | 50 |
| HS19050082-02           | 67WW13-190501 FD                                       | 01 May 2019 08:00 |           |                            | 03 May 2019 05:00 | 5  |
| HS19050082-03           | 67WW08-190501  | 01 May 2019 09:00 |           |                            | 03 May 2019 06:13 | 50 |
| HS19050082-03           | 67WW08-190501  | 01 May 2019 09:00 |           |                            | 03 May 2019 05:29 | 5  |
| <b>Batch ID</b> R338352 | <b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C  |                   |           | <b>Matrix:</b> Water       |                   |    |
| HS19050082-07           | Trip Blank   | 01 May 2019 00:00 |           |                            | 13 May 2019 18:08 | 1  |
| <b>Batch ID</b> R338352 | <b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C  |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS19050082-01           | 67WW13-190501  | 01 May 2019 08:00 |           |                            | 13 May 2019 19:21 | 1  |
| HS19050082-02           | 67WW13-190501 FD                                       | 01 May 2019 08:00 |           |                            | 13 May 2019 20:09 | 1  |
| HS19050082-03           | 67WW08-190501  | 01 May 2019 09:00 |           |                            | 13 May 2019 20:57 | 1  |
| HS19050082-04           | 67WW11-190501  | 01 May 2019 09:55 |           |                            | 13 May 2019 18:32 | 1  |
| HS19050082-05           | 67WW16I-190501   | 01 May 2019 10:45 |           |                            | 13 May 2019 18:57 | 1  |
| HS19050082-06           | 67WW02-190501  | 01 May 2019 11:35 |           |                            | 13 May 2019 21:21 | 1  |
| <b>Batch ID</b> R338362 | <b>Test Name :</b> SUBCONTRACT ANALYSIS - TOC ANALYSIS |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS19050082-01           | 67WW13-190501  | 01 May 2019 08:00 |           |                            | 14 May 2019 12:57 | 1  |
| HS19050082-02           | 67WW13-190501 FD                                       | 01 May 2019 08:00 |           |                            | 14 May 2019 12:57 | 1  |
| HS19050082-03           | 67WW08-190501  | 01 May 2019 09:00 |           |                            | 14 May 2019 12:57 | 1  |
| <b>Batch ID</b> R338663 | <b>Test Name :</b> SUBCONTRACT ANALYSIS - RSK          |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS19050082-01           | 67WW13-190501  | 01 May 2019 08:00 |           |                            | 17 May 2019 15:08 | 1  |
| HS19050082-02           | 67WW13-190501 FD                                       | 01 May 2019 08:00 |           |                            | 17 May 2019 15:08 | 1  |
| HS19050082-03           | 67WW08-190501  | 01 May 2019 09:00 |           |                            | 17 May 2019 15:08 | 1  |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )              |                         | Instrument: VOA6 |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |               |               |      |                |
|--------------------------------------|-------------------------|------------------|---------|--|------|---------------|---------------|------|----------------|
| <b>MBLK</b>                          | Sample ID: VBLKW-190513 | Units: UG/L      |         | Analysis Date: 13-May-2019 17:44           |      |               |               |      |                |
| Client ID:                           | Run ID: VOA6_338352     | SeqNo: 5073708   |         | PrepDate:                                  |      | DF: 1         |               |      |                |
| Analyte                              | Result                  | PQL              | SPK Val | SPK Ref Value                              | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1,1-Trichloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1,2,2-Tetrachloroethane            | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1,2-Trichloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1-Dichloroethane                   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1-Dichloroethene                   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,1-Dichloropropene                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2,3-Trichlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2,3-Trichloropropane               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2,4-Trichlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2,4-Trimethylbenzene               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2-Dibromo-3-chloropropane          | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2-Dibromoethane                    | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2-Dichloroethane                   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,2-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,3,5-Trimethylbenzene               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,3-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,3-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 1,4-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 2,2-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 2-Butanone                           | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| 2-Chlorotoluene                      | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 2-Hexanone                           | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| 4-Chlorotoluene                      | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 4-Isopropyltoluene                   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| 4-Methyl-2-pentanone                 | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| Acetone                              | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| Benzene                              | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Bromobenzene                         | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Bromochloromethane                   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Bromodichloromethane                 | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Bromoform                            | 0.50                    | 1.0              |         |  |      |               |               |      | U              |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )     |                         | Instrument: VOA6 |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |               |               |      |                |
|-----------------------------|-------------------------|------------------|---------|--|------|---------------|---------------|------|----------------|
| <b>MBLK</b>                 | Sample ID: VBLKW-190513 | Units: UG/L      |         | Analysis Date: 13-May-2019 17:44           |      |               |               |      |                |
| Client ID:                  | Run ID: VOA6_338352     | SeqNo: 5073708   |         | PrepDate:                                  |      | DF: 1         |               |      |                |
| Analyte                     | Result                  | PQL              | SPK Val | SPK Ref Value                              | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Bromomethane                | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Carbon disulfide            | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| Carbon tetrachloride        | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Chlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Chloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Chloroform                  | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Chloromethane               | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| cis-1,2-Dichloroethene      | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| cis-1,3-Dichloropropene     | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Dibromochloromethane        | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Dibromomethane              | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Dichlorodifluoromethane     | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Ethylbenzene                | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Hexachlorobutadiene         | 1.0                     | 1.0              |         |  |      |               |               |      | U              |
| Isopropylbenzene            | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| m,p-Xylene                  | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| Methylene chloride          | 1.0                     | 2.0              |         |  |      |               |               |      | U              |
| Naphthalene                 | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| n-Butylbenzene              | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| n-Propylbenzene             | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| o-Xylene                    | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| sec-Butylbenzene            | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Styrene                     | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| tert-Butylbenzene           | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Tetrachloroethene           | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Toluene                     | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| trans-1,2-Dichloroethene    | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| trans-1,3-Dichloropropene   | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Trichloroethene             | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Trichlorofluoromethane      | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Vinyl chloride              | 0.50                    | 1.0              |         |  |      |               |               |      | U              |
| Surr: 1,2-Dichloroethane-d4 | 44.3                    | 1.0              | 50      | 0  | 88.6 | 81 - 118      |               |      |                |
| Surr: 4-Bromofluorobenzene  | 49.08                   | 1.0              | 50      | 0  | 98.2 | 85 - 114      |               |      |                |
| Surr: Dibromofluoromethane  | 45.08                   | 1.0              | 50      | 0  | 90.2 | 80 - 119      |               |      |                |

ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**QC BATCH REPORT**

| Batch ID: R338352 ( 0 ) |                                | Instrument: VOA6   |                       | Method: VOLATILES ORGANICS BY METHOD 8260C |            |                 |               |      |                |
|-------------------------|--------------------------------|--------------------|-----------------------|--|------------|-----------------|---------------|------|----------------|
| <b>MBLK</b>             | Sample ID: <b>VBLKW-190513</b> | Units: <b>UG/L</b> |                       | Analysis Date: <b>13-May-2019 17:44</b>    |            |                 |               |      |                |
| Client ID:              | Run ID: <b>VOA6_338352</b>     |                    | SeqNo: <b>5073708</b> |  | PrepDate:  |                 | DF: <b>1</b>  |      |                |
| Analyte                 | Result                         | PQL                | SPK Val               | SPK Ref Value                              | %REC       | Control Limit   | RPD Ref Value | %RPD | RPD Limit Qual |
| <i>Surr: Toluene-d8</i> | <i>52.81</i>                   | <i>1.0</i>         | <i>50</i>             | <i>0</i>                                   | <i>106</i> | <i>89 - 112</i> |               |      |                |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )              |        | Instrument: VOA6        |         | Method: VOLATILES ORGANICS BY METHOD 8260C |       |                                  |               |       |                |
|--------------------------------------|--------|-------------------------|---------|--|-------|----------------------------------|---------------|-------|----------------|
| LCS                                  |        | Sample ID: VLCSW-190513 |         | Units: UG/L                                |       | Analysis Date: 13-May-2019 16:56 |               |       |                |
| Client ID:                           |        | Run ID: VOA6_338352     |         | SeqNo: 5073707                             |       | PrepDate:                        |               | DF: 1 |                |
| Analyte                              | Result | PQL                     | SPK Val | SPK Ref Value                              | %REC  | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 19.32  | 1.0                     | 20      | 0  | 96.6  | 78 - 124                         |               |       |                |
| 1,1,1-Trichloroethane                | 19.74  | 1.0                     | 20      | 0  | 98.7  | 74 - 131                         |               |       |                |
| 1,1,2,2-Tetrachloroethane            | 19.96  | 1.0                     | 20      | 0  | 99.8  | 71 - 121                         |               |       |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 20.59  | 1.0                     | 20      | 0  | 103   | 70 - 136                         |               |       |                |
| 1,1,2-Trichloroethane                | 19.96  | 1.0                     | 20      | 0  | 99.8  | 80 - 119                         |               |       |                |
| 1,1-Dichloroethane                   | 19.16  | 1.0                     | 20      | 0  | 95.8  | 77 - 125                         |               |       |                |
| 1,1-Dichloroethene                   | 19.01  | 1.0                     | 20      | 0  | 95.0  | 71 - 131                         |               |       |                |
| 1,1-Dichloropropene                  | 18.91  | 1.0                     | 20      | 0  | 94.6  | 78 - 125                         |               |       |                |
| 1,2,3-Trichlorobenzene               | 26.33  | 1.0                     | 20      | 0  | 132   | 69 - 129                         |               |       | S              |
| 1,2,3-Trichloropropane               | 20.19  | 1.0                     | 20      | 0  | 101   | 73 - 122                         |               |       |                |
| 1,2,4-Trichlorobenzene               | 22.75  | 1.0                     | 20      | 0  | 114   | 69 - 130                         |               |       |                |
| 1,2,4-Trimethylbenzene               | 19.99  | 1.0                     | 20      | 0  | 100.0 | 76 - 124                         |               |       |                |
| 1,2-Dibromo-3-chloropropane          | 21.98  | 1.0                     | 20      | 0  | 110   | 62 - 128                         |               |       |                |
| 1,2-Dibromoethane                    | 19.95  | 1.0                     | 20      | 0  | 99.7  | 77 - 121                         |               |       |                |
| 1,2-Dichlorobenzene                  | 20.17  | 1.0                     | 20      | 0  | 101   | 80 - 119                         |               |       |                |
| 1,2-Dichloroethane                   | 19.03  | 1.0                     | 20      | 0  | 95.1  | 73 - 128                         |               |       |                |
| 1,2-Dichloropropane                  | 19.29  | 1.0                     | 20      | 0  | 96.5  | 78 - 122                         |               |       |                |
| 1,3,5-Trimethylbenzene               | 20.09  | 1.0                     | 20      | 0  | 100   | 75 - 124                         |               |       |                |
| 1,3-Dichlorobenzene                  | 20.05  | 1.0                     | 20      | 0  | 100   | 80 - 119                         |               |       |                |
| 1,3-Dichloropropane                  | 19.64  | 1.0                     | 20      | 0  | 98.2  | 80 - 119                         |               |       |                |
| 1,4-Dichlorobenzene                  | 19.97  | 1.0                     | 20      | 0  | 99.8  | 79 - 118                         |               |       |                |
| 2,2-Dichloropropane                  | 19.91  | 1.0                     | 20      | 0  | 99.6  | 60 - 139                         |               |       |                |
| 2-Butanone                           | 44.93  | 2.0                     | 40      | 0  | 112   | 56 - 143                         |               |       |                |
| 2-Chlorotoluene                      | 19.35  | 1.0                     | 20      | 0  | 96.8  | 79 - 122                         |               |       |                |
| 2-Hexanone                           | 41.25  | 2.0                     | 40      | 0  | 103   | 57 - 139                         |               |       |                |
| 4-Chlorotoluene                      | 19.51  | 1.0                     | 20      | 0  | 97.6  | 78 - 122                         |               |       |                |
| 4-Isopropyltoluene                   | 20.04  | 1.0                     | 20      | 0  | 100   | 77 - 127                         |               |       |                |
| 4-Methyl-2-pentanone                 | 39.31  | 2.0                     | 40      | 0  | 98.3  | 67 - 130                         |               |       |                |
| Acetone                              | 49.56  | 2.0                     | 40      | 0  | 124   | 39 - 160                         |               |       |                |
| Benzene                              | 19.56  | 1.0                     | 20      | 0  | 97.8  | 79 - 120                         |               |       |                |
| Bromobenzene                         | 19.88  | 1.0                     | 20      | 0  | 99.4  | 80 - 120                         |               |       |                |
| Bromochloromethane                   | 21.04  | 1.0                     | 20      | 0  | 105   | 78 - 123                         |               |       |                |
| Bromodichloromethane                 | 19.76  | 1.0                     | 20      | 0  | 98.8  | 79 - 125                         |               |       |                |
| Bromoform                            | 20.81  | 1.0                     | 20      | 0  | 104   | 66 - 130                         |               |       |                |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )     |        | Instrument: VOA6        |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|-------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| LCS                         |        | Sample ID: VLCSW-190513 |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 16:56 |               |       |                |
| Client ID:                  |        | Run ID: VOA6_338352     |         | SeqNo: 5073707                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                     | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 23.51  | 1.0                     | 20      | 0  | 118  | 53 - 141                         |               |       |                |
| Carbon disulfide            | 39.35  | 2.0                     | 40      | 0  | 98.4 | 64 - 133                         |               |       |                |
| Carbon tetrachloride        | 18.37  | 1.0                     | 20      | 0  | 91.8 | 72 - 136                         |               |       |                |
| Chlorobenzene               | 19.71  | 1.0                     | 20      | 0  | 98.5 | 82 - 118                         |               |       |                |
| Chloroethane                | 18.84  | 1.0                     | 20      | 0  | 94.2 | 60 - 138                         |               |       |                |
| Chloroform                  | 19.88  | 1.0                     | 20      | 0  | 99.4 | 79 - 124                         |               |       |                |
| Chloromethane               | 17.84  | 1.0                     | 20      | 0  | 89.2 | 50 - 139                         |               |       |                |
| cis-1,2-Dichloroethene      | 20.11  | 1.0                     | 20      | 0  | 101  | 78 - 123                         |               |       |                |
| cis-1,3-Dichloropropene     | 20.11  | 1.0                     | 20      | 0  | 101  | 75 - 124                         |               |       |                |
| Dibromochloromethane        | 19.59  | 1.0                     | 20      | 0  | 98.0 | 74 - 126                         |               |       |                |
| Dibromomethane              | 19.94  | 1.0                     | 20      | 0  | 99.7 | 79 - 123                         |               |       |                |
| Dichlorodifluoromethane     | 19.48  | 1.0                     | 20      | 0  | 97.4 | 32 - 152                         |               |       |                |
| Ethylbenzene                | 19.89  | 1.0                     | 20      | 0  | 99.4 | 79 - 121                         |               |       |                |
| Hexachlorobutadiene         | 23.13  | 1.0                     | 20      | 0  | 116  | 66 - 134                         |               |       |                |
| Isopropylbenzene            | 19.77  | 1.0                     | 20      | 0  | 98.8 | 72 - 131                         |               |       |                |
| m,p-Xylene                  | 39.48  | 2.0                     | 40      | 0  | 98.7 | 80 - 121                         |               |       |                |
| Methylene chloride          | 20.07  | 2.0                     | 20      | 0  | 100  | 74 - 124                         |               |       |                |
| Naphthalene                 | 23.84  | 1.0                     | 20      | 0  | 119  | 61 - 128                         |               |       |                |
| n-Butylbenzene              | 20.9   | 1.0                     | 20      | 0  | 104  | 75 - 128                         |               |       |                |
| n-Propylbenzene             | 19.84  | 1.0                     | 20      | 0  | 99.2 | 76 - 126                         |               |       |                |
| o-Xylene                    | 20.01  | 1.0                     | 20      | 0  | 100  | 78 - 122                         |               |       |                |
| sec-Butylbenzene            | 20     | 1.0                     | 20      | 0  | 100  | 77 - 126                         |               |       |                |
| Styrene                     | 19.91  | 1.0                     | 20      | 0  | 99.6 | 78 - 123                         |               |       |                |
| tert-Butylbenzene           | 20.1   | 1.0                     | 20      | 0  | 101  | 78 - 124                         |               |       |                |
| Tetrachloroethene           | 19.89  | 1.0                     | 20      | 0  | 99.4 | 74 - 129                         |               |       |                |
| Toluene                     | 19.66  | 1.0                     | 20      | 0  | 98.3 | 80 - 121                         |               |       |                |
| trans-1,2-Dichloroethene    | 20.14  | 1.0                     | 20      | 0  | 101  | 75 - 124                         |               |       |                |
| trans-1,3-Dichloropropene   | 20.59  | 1.0                     | 20      | 0  | 103  | 73 - 127                         |               |       |                |
| Trichloroethene             | 19.3   | 1.0                     | 20      | 0  | 96.5 | 79 - 123                         |               |       |                |
| Trichlorofluoromethane      | 18.83  | 1.0                     | 20      | 0  | 94.2 | 65 - 141                         |               |       |                |
| Vinyl chloride              | 18.45  | 1.0                     | 20      | 0  | 92.3 | 58 - 137                         |               |       |                |
| Surr: 1,2-Dichloroethane-d4 | 51.97  | 1.0                     | 50      | 0  | 104  | 81 - 118                         |               |       |                |
| Surr: 4-Bromofluorobenzene  | 52.24  | 1.0                     | 50      | 0  | 104  | 85 - 114                         |               |       |                |
| Surr: Dibromofluoromethane  | 52.15  | 1.0                     | 50      | 0  | 104  | 80 - 119                         |               |       |                |



ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**QC BATCH REPORT**

| Batch ID: R338352 ( 0 ) |                                | Instrument: VOA6   |                       | Method: VOLATILES ORGANICS BY METHOD 8260C |           |               |               |      |                |
|-------------------------|--------------------------------|--------------------|-----------------------|--|-----------|---------------|---------------|------|----------------|
| <b>LCS</b>              | Sample ID: <b>VLCSW-190513</b> | Units: <b>UG/L</b> |                       | Analysis Date: <b>13-May-2019 16:56</b>    |           |               |               |      |                |
| Client ID:              | Run ID: <b>VOA6_338352</b>     |                    | SeqNo: <b>5073707</b> |  | PrepDate: |               | DF: <b>1</b>  |      |                |
| Analyte                 | Result                         | PQL                | SPK Val               | SPK Ref Value                              | %REC      | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| <i>Surr: Toluene-d8</i> | 50.73                          | 1.0                | 50                    | 0  | 101       | 89 - 112      |               |      |                |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )              |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|--------------------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MS                                   |        | Sample ID: HS19050082-04MS |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 21:45 |               |       |                |
| Client ID: 67WW11-190501             |        | Run ID: VOA6_338352        |         | SeqNo: 5073721                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                              | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 18.38  | 1.0                        | 20      | 0  | 91.9 | 78 - 124                         |               |       |                |
| 1,1,1-Trichloroethane                | 17     | 1.0                        | 20      | 0  | 85.0 | 74 - 131                         |               |       |                |
| 1,1,2,2-Tetrachloroethane            | 18.91  | 1.0                        | 20      | 0  | 94.6 | 71 - 121                         |               |       |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 18.11  | 1.0                        | 20      | 0  | 90.6 | 70 - 136                         |               |       |                |
| 1,1,2-Trichloroethane                | 18.74  | 1.0                        | 20      | 0  | 93.7 | 80 - 119                         |               |       |                |
| 1,1-Dichloroethane                   | 18.38  | 1.0                        | 20      | 1.906                                      | 82.4 | 77 - 125                         |               |       |                |
| 1,1-Dichloroethene                   | 20.24  | 1.0                        | 20      | 2.829                                      | 87.0 | 71 - 131                         |               |       |                |
| 1,1-Dichloropropene                  | 18.11  | 1.0                        | 20      | 0  | 90.5 | 78 - 125                         |               |       |                |
| 1,2,3-Trichlorobenzene               | 19.32  | 1.0                        | 20      | 0  | 96.6 | 69 - 129                         |               |       |                |
| 1,2,3-Trichloropropane               | 18.22  | 1.0                        | 20      | 0  | 91.1 | 73 - 122                         |               |       |                |
| 1,2,4-Trichlorobenzene               | 18.36  | 1.0                        | 20      | 0  | 91.8 | 69 - 130                         |               |       |                |
| 1,2,4-Trimethylbenzene               | 18.5   | 1.0                        | 20      | 0  | 92.5 | 76 - 124                         |               |       |                |
| 1,2-Dibromo-3-chloropropane          | 20.34  | 1.0                        | 20      | 0  | 102  | 62 - 128                         |               |       |                |
| 1,2-Dibromoethane                    | 18.59  | 1.0                        | 20      | 0  | 93.0 | 77 - 121                         |               |       |                |
| 1,2-Dichlorobenzene                  | 19.14  | 1.0                        | 20      | 0  | 95.7 | 80 - 119                         |               |       |                |
| 1,2-Dichloroethane                   | 17.02  | 1.0                        | 20      | 0  | 85.1 | 73 - 128                         |               |       |                |
| 1,2-Dichloropropane                  | 17.77  | 1.0                        | 20      | 0  | 88.9 | 78 - 122                         |               |       |                |
| 1,3,5-Trimethylbenzene               | 19.24  | 1.0                        | 20      | 0  | 96.2 | 75 - 124                         |               |       |                |
| 1,3-Dichlorobenzene                  | 18.99  | 1.0                        | 20      | 0  | 95.0 | 80 - 119                         |               |       |                |
| 1,3-Dichloropropane                  | 18.8   | 1.0                        | 20      | 0  | 94.0 | 80 - 119                         |               |       |                |
| 1,4-Dichlorobenzene                  | 18.49  | 1.0                        | 20      | 0  | 92.4 | 79 - 118                         |               |       |                |
| 2,2-Dichloropropane                  | 15.87  | 1.0                        | 20      | 0  | 79.3 | 60 - 139                         |               |       |                |
| 2-Butanone                           | 34.89  | 2.0                        | 40      | 0  | 87.2 | 56 - 143                         |               |       |                |
| 2-Chlorotoluene                      | 19.12  | 1.0                        | 20      | 0  | 95.6 | 79 - 122                         |               |       |                |
| 2-Hexanone                           | 35.13  | 2.0                        | 40      | 0  | 87.8 | 57 - 139                         |               |       |                |
| 4-Chlorotoluene                      | 18.74  | 1.0                        | 20      | 0  | 93.7 | 78 - 122                         |               |       |                |
| 4-Isopropyltoluene                   | 19.69  | 1.0                        | 20      | 0  | 98.5 | 77 - 127                         |               |       |                |
| 4-Methyl-2-pentanone                 | 37.77  | 2.0                        | 40      | 0  | 94.4 | 67 - 130                         |               |       |                |
| Acetone                              | 33.27  | 2.0                        | 40      | 5.643                                      | 69.1 | 39 - 160                         |               |       |                |
| Benzene                              | 17.26  | 1.0                        | 20      | 0  | 86.3 | 79 - 120                         |               |       |                |
| Bromobenzene                         | 18.15  | 1.0                        | 20      | 0  | 90.7 | 80 - 120                         |               |       |                |
| Bromochloromethane                   | 16.25  | 1.0                        | 20      | 0  | 81.2 | 78 - 123                         |               |       |                |
| Bromodichloromethane                 | 17.06  | 1.0                        | 20      | 0  | 85.3 | 79 - 125                         |               |       |                |
| Bromoform                            | 18.99  | 1.0                        | 20      | 0  | 94.9 | 66 - 130                         |               |       |                |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )     |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MS                          |        | Sample ID: HS19050082-04MS |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 21:45 |               |       |                |
| Client ID: 67WW11-190501    |        | Run ID: VOA6_338352        |         | SeqNo: 5073721                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 15.21  | 1.0                        | 20      | 0  | 76.1 | 53 - 141                         |               |       |                |
| Carbon disulfide            | 34.68  | 2.0                        | 40      | 0  | 86.7 | 64 - 133                         |               |       |                |
| Carbon tetrachloride        | 17.09  | 1.0                        | 20      | 0  | 85.4 | 72 - 136                         |               |       |                |
| Chlorobenzene               | 19.08  | 1.0                        | 20      | 0  | 95.4 | 82 - 118                         |               |       |                |
| Chloroethane                | 16.8   | 1.0                        | 20      | 0  | 84.0 | 60 - 138                         |               |       |                |
| Chloroform                  | 16.27  | 1.0                        | 20      | 0  | 81.4 | 79 - 124                         |               |       |                |
| Chloromethane               | 15.34  | 1.0                        | 20      | 0  | 76.7 | 50 - 139                         |               |       |                |
| cis-1,2-Dichloroethene      | 15.99  | 1.0                        | 20      | 0  | 79.9 | 78 - 123                         |               |       |                |
| cis-1,3-Dichloropropene     | 18.14  | 1.0                        | 20      | 0  | 90.7 | 75 - 124                         |               |       |                |
| Dibromochloromethane        | 18.69  | 1.0                        | 20      | 0  | 93.4 | 74 - 126                         |               |       |                |
| Dibromomethane              | 17.09  | 1.0                        | 20      | 0  | 85.5 | 79 - 123                         |               |       |                |
| Dichlorodifluoromethane     | 14.6   | 1.0                        | 20      | 0  | 73.0 | 32 - 152                         |               |       |                |
| Ethylbenzene                | 18.84  | 1.0                        | 20      | 0  | 94.2 | 79 - 121                         |               |       |                |
| Hexachlorobutadiene         | 19.78  | 1.0                        | 20      | 0  | 98.9 | 66 - 134                         |               |       |                |
| Isopropylbenzene            | 19.04  | 1.0                        | 20      | 0  | 95.2 | 72 - 131                         |               |       |                |
| m,p-Xylene                  | 38.56  | 2.0                        | 40      | 0  | 96.4 | 80 - 121                         |               |       |                |
| Methylene chloride          | 16.93  | 2.0                        | 20      | 0  | 84.7 | 74 - 124                         |               |       |                |
| Naphthalene                 | 18     | 1.0                        | 20      | 0  | 90.0 | 61 - 128                         |               |       |                |
| n-Butylbenzene              | 19.52  | 1.0                        | 20      | 0  | 97.6 | 75 - 128                         |               |       |                |
| n-Propylbenzene             | 19.91  | 1.0                        | 20      | 0  | 99.5 | 76 - 126                         |               |       |                |
| o-Xylene                    | 19.35  | 1.0                        | 20      | 0  | 96.7 | 78 - 122                         |               |       |                |
| sec-Butylbenzene            | 20.19  | 1.0                        | 20      | 0  | 101  | 77 - 126                         |               |       |                |
| Styrene                     | 18.44  | 1.0                        | 20      | 0  | 92.2 | 78 - 123                         |               |       |                |
| tert-Butylbenzene           | 20.21  | 1.0                        | 20      | 0  | 101  | 78 - 124                         |               |       |                |
| Tetrachloroethene           | 19.61  | 1.0                        | 20      | 0  | 98.1 | 74 - 129                         |               |       |                |
| Toluene                     | 18.68  | 1.0                        | 20      | 0  | 93.4 | 80 - 121                         |               |       |                |
| trans-1,2-Dichloroethene    | 17.21  | 1.0                        | 20      | 0  | 86.1 | 75 - 124                         |               |       |                |
| trans-1,3-Dichloropropene   | 17.11  | 1.0                        | 20      | 0  | 85.6 | 73 - 127                         |               |       |                |
| Trichloroethene             | 18.04  | 1.0                        | 20      | 0  | 90.2 | 79 - 123                         |               |       |                |
| Trichlorofluoromethane      | 16.69  | 1.0                        | 20      | 0  | 83.4 | 65 - 141                         |               |       |                |
| Vinyl chloride              | 17.21  | 1.0                        | 20      | 0  | 86.1 | 58 - 137                         |               |       |                |
| Surr: 1,2-Dichloroethane-d4 | 44.43  | 1.0                        | 50      | 0  | 88.9 | 81 - 118                         |               |       |                |
| Surr: 4-Bromofluorobenzene  | 49.85  | 1.0                        | 50      | 0  | 99.7 | 85 - 114                         |               |       |                |
| Surr: Dibromofluoromethane  | 45.28  | 1.0                        | 50      | 0  | 90.6 | 80 - 119                         |               |       |                |

ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**QC BATCH REPORT**

| Batch ID: R338352 ( 0 )  |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |          |                |
|--------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|----------|----------------|
| <b>MS</b>                |        | Sample ID: HS19050082-04MS |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 21:45 |               |          |                |
| Client ID: 67WW11-190501 |        | Run ID: VOA6_338352        |         | SeqNo: 5073721                             |      | PrepDate:                        |               | DF: 1    |                |
| Analyte                  | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | RPD %RPD | RPD Limit Qual |
| Surr: Toluene-d8         | 52.44  | 1.0                        | 50      | 0  | 105  | 89 - 112                         |               |          |                |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )              |        | Instrument: VOA6            |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |        |                |
|--------------------------------------|--------|-----------------------------|---------|--|------|----------------------------------|---------------|--------|----------------|
| MSD                                  |        | Sample ID: HS19050082-04MSD |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 22:09 |               |        |                |
| Client ID: 67WW11-190501             |        | Run ID: VOA6_338352         |         | SeqNo: 5073722                             |      | PrepDate:                        |               | DF: 1  |                |
| Analyte                              | Result | PQL                         | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD   | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 17.3   | 1.0                         | 20      | 0  | 86.5 | 78 - 124                         | 18.38         | 6.05   | 20             |
| 1,1,1-Trichloroethane                | 15.97  | 1.0                         | 20      | 0  | 79.9 | 74 - 131                         | 17            | 6.21   | 20             |
| 1,1,2,2-Tetrachloroethane            | 19.33  | 1.0                         | 20      | 0  | 96.7 | 71 - 121                         | 18.91         | 2.2    | 20             |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 17.02  | 1.0                         | 20      | 0  | 85.1 | 70 - 136                         | 18.11         | 6.23   | 20             |
| 1,1,2-Trichloroethane                | 17.66  | 1.0                         | 20      | 0  | 88.3 | 80 - 119                         | 18.74         | 5.89   | 20             |
| 1,1-Dichloroethane                   | 17.07  | 1.0                         | 20      | 1.906                                      | 75.8 | 77 - 125                         | 18.38         | 7.41   | 20 S           |
| 1,1-Dichloroethene                   | 18.49  | 1.0                         | 20      | 2.829                                      | 78.3 | 71 - 131                         | 20.24         | 9.04   | 20             |
| 1,1-Dichloropropene                  | 16.94  | 1.0                         | 20      | 0  | 84.7 | 78 - 125                         | 18.11         | 6.67   | 20             |
| 1,2,3-Trichlorobenzene               | 20.38  | 1.0                         | 20      | 0  | 102  | 69 - 129                         | 19.32         | 5.34   | 20             |
| 1,2,3-Trichloropropane               | 18.49  | 1.0                         | 20      | 0  | 92.5 | 73 - 122                         | 18.22         | 1.45   | 20             |
| 1,2,4-Trichlorobenzene               | 18.57  | 1.0                         | 20      | 0  | 92.9 | 69 - 130                         | 18.36         | 1.15   | 20             |
| 1,2,4-Trimethylbenzene               | 18.05  | 1.0                         | 20      | 0  | 90.2 | 76 - 124                         | 18.5          | 2.46   | 20             |
| 1,2-Dibromo-3-chloropropane          | 20.33  | 1.0                         | 20      | 0  | 102  | 62 - 128                         | 20.34         | 0.0561 | 20             |
| 1,2-Dibromoethane                    | 17.79  | 1.0                         | 20      | 0  | 89.0 | 77 - 121                         | 18.59         | 4.4    | 20             |
| 1,2-Dichlorobenzene                  | 18.76  | 1.0                         | 20      | 0  | 93.8 | 80 - 119                         | 19.14         | 2      | 20             |
| 1,2-Dichloroethane                   | 16.27  | 1.0                         | 20      | 0  | 81.3 | 73 - 128                         | 17.02         | 4.54   | 20             |
| 1,2-Dichloropropane                  | 16.69  | 1.0                         | 20      | 0  | 83.5 | 78 - 122                         | 17.77         | 6.29   | 20             |
| 1,3,5-Trimethylbenzene               | 19.05  | 1.0                         | 20      | 0  | 95.3 | 75 - 124                         | 19.24         | 0.967  | 20             |
| 1,3-Dichlorobenzene                  | 18.61  | 1.0                         | 20      | 0  | 93.1 | 80 - 119                         | 18.99         | 2      | 20             |
| 1,3-Dichloropropane                  | 18.03  | 1.0                         | 20      | 0  | 90.1 | 80 - 119                         | 18.8          | 4.22   | 20             |
| 1,4-Dichlorobenzene                  | 18.54  | 1.0                         | 20      | 0  | 92.7 | 79 - 118                         | 18.49         | 0.299  | 20             |
| 2,2-Dichloropropane                  | 14.41  | 1.0                         | 20      | 0  | 72.0 | 60 - 139                         | 15.87         | 9.67   | 20             |
| 2-Butanone                           | 33.51  | 2.0                         | 40      | 0  | 83.8 | 56 - 143                         | 34.89         | 4.06   | 20             |
| 2-Chlorotoluene                      | 18.65  | 1.0                         | 20      | 0  | 93.2 | 79 - 122                         | 19.12         | 2.49   | 20             |
| 2-Hexanone                           | 34.74  | 2.0                         | 40      | 0  | 86.9 | 57 - 139                         | 35.13         | 1.09   | 20             |
| 4-Chlorotoluene                      | 18.58  | 1.0                         | 20      | 0  | 92.9 | 78 - 122                         | 18.74         | 0.857  | 20             |
| 4-Isopropyltoluene                   | 19.33  | 1.0                         | 20      | 0  | 96.7 | 77 - 127                         | 19.69         | 1.83   | 20             |
| 4-Methyl-2-pentanone                 | 35.81  | 2.0                         | 40      | 0  | 89.5 | 67 - 130                         | 37.77         | 5.31   | 20             |
| Acetone                              | 31.29  | 2.0                         | 40      | 5.643                                      | 64.1 | 39 - 160                         | 33.27         | 6.15   | 20             |
| Benzene                              | 16.35  | 1.0                         | 20      | 0  | 81.7 | 79 - 120                         | 17.26         | 5.42   | 20             |
| Bromobenzene                         | 18.08  | 1.0                         | 20      | 0  | 90.4 | 80 - 120                         | 18.15         | 0.365  | 20             |
| Bromochloromethane                   | 15.08  | 1.0                         | 20      | 0  | 75.4 | 78 - 123                         | 16.25         | 7.47   | 20 S           |
| Bromodichloromethane                 | 16.38  | 1.0                         | 20      | 0  | 81.9 | 79 - 125                         | 17.06         | 4.07   | 20             |
| Bromoform                            | 18.07  | 1.0                         | 20      | 0  | 90.4 | 66 - 130                         | 18.99         | 4.94   | 20             |

## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R338352 ( 0 )     |        | Instrument: VOA6            |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|-----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MSD                         |        | Sample ID: HS19050082-04MSD |         | Units: UG/L                                |      | Analysis Date: 13-May-2019 22:09 |               |       |                |
| Client ID: 67WW11-190501    |        | Run ID: VOA6_338352         |         | SeqNo: 5073722                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                         | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 13.29  | 1.0                         | 20      | 0  | 66.5 | 53 - 141                         | 15.21         | 13.5  | 20             |
| Carbon disulfide            | 31.89  | 2.0                         | 40      | 0  | 79.7 | 64 - 133                         | 34.68         | 8.38  | 20             |
| Carbon tetrachloride        | 16.24  | 1.0                         | 20      | 0  | 81.2 | 72 - 136                         | 17.09         | 5.11  | 20             |
| Chlorobenzene               | 17.58  | 1.0                         | 20      | 0  | 87.9 | 82 - 118                         | 19.08         | 8.17  | 20             |
| Chloroethane                | 15.07  | 1.0                         | 20      | 0  | 75.4 | 60 - 138                         | 16.8          | 10.8  | 20             |
| Chloroform                  | 15.08  | 1.0                         | 20      | 0  | 75.4 | 79 - 124                         | 16.27         | 7.62  | 20 S           |
| Chloromethane               | 13.67  | 1.0                         | 20      | 0  | 68.4 | 50 - 139                         | 15.34         | 11.5  | 20             |
| cis-1,2-Dichloroethene      | 15.07  | 1.0                         | 20      | 0  | 75.4 | 78 - 123                         | 15.99         | 5.89  | 20 S           |
| cis-1,3-Dichloropropene     | 17.47  | 1.0                         | 20      | 0  | 87.4 | 75 - 124                         | 18.14         | 3.77  | 20             |
| Dibromochloromethane        | 17.73  | 1.0                         | 20      | 0  | 88.6 | 74 - 126                         | 18.69         | 5.27  | 20             |
| Dibromomethane              | 16.39  | 1.0                         | 20      | 0  | 81.9 | 79 - 123                         | 17.09         | 4.23  | 20             |
| Dichlorodifluoromethane     | 13.62  | 1.0                         | 20      | 0  | 68.1 | 32 - 152                         | 14.6          | 6.91  | 20             |
| Ethylbenzene                | 17.35  | 1.0                         | 20      | 0  | 86.8 | 79 - 121                         | 18.84         | 8.2   | 20             |
| Hexachlorobutadiene         | 19.74  | 1.0                         | 20      | 0  | 98.7 | 66 - 134                         | 19.78         | 0.213 | 20             |
| Isopropylbenzene            | 17.86  | 1.0                         | 20      | 0  | 89.3 | 72 - 131                         | 19.04         | 6.4   | 20             |
| m,p-Xylene                  | 35.44  | 2.0                         | 40      | 0  | 88.6 | 80 - 121                         | 38.56         | 8.44  | 20             |
| Methylene chloride          | 15.64  | 2.0                         | 20      | 0  | 78.2 | 74 - 124                         | 16.93         | 7.92  | 20             |
| Naphthalene                 | 18.29  | 1.0                         | 20      | 0  | 91.4 | 61 - 128                         | 18            | 1.6   | 20             |
| n-Butylbenzene              | 18.98  | 1.0                         | 20      | 0  | 94.9 | 75 - 128                         | 19.52         | 2.78  | 20             |
| n-Propylbenzene             | 19.28  | 1.0                         | 20      | 0  | 96.4 | 76 - 126                         | 19.91         | 3.21  | 20             |
| o-Xylene                    | 18.25  | 1.0                         | 20      | 0  | 91.2 | 78 - 122                         | 19.35         | 5.87  | 20             |
| sec-Butylbenzene            | 19.61  | 1.0                         | 20      | 0  | 98.0 | 77 - 126                         | 20.19         | 2.93  | 20             |
| Styrene                     | 17.3   | 1.0                         | 20      | 0  | 86.5 | 78 - 123                         | 18.44         | 6.36  | 20             |
| tert-Butylbenzene           | 19.81  | 1.0                         | 20      | 0  | 99.1 | 78 - 124                         | 20.21         | 1.97  | 20             |
| Tetrachloroethene           | 17.92  | 1.0                         | 20      | 0  | 89.6 | 74 - 129                         | 19.61         | 9     | 20             |
| Toluene                     | 17.39  | 1.0                         | 20      | 0  | 86.9 | 80 - 121                         | 18.68         | 7.15  | 20             |
| trans-1,2-Dichloroethene    | 15.81  | 1.0                         | 20      | 0  | 79.1 | 75 - 124                         | 17.21         | 8.47  | 20             |
| trans-1,3-Dichloropropene   | 16.67  | 1.0                         | 20      | 0  | 83.4 | 73 - 127                         | 17.11         | 2.62  | 20             |
| Trichloroethene             | 16.92  | 1.0                         | 20      | 0  | 84.6 | 79 - 123                         | 18.04         | 6.42  | 20             |
| Trichlorofluoromethane      | 15.12  | 1.0                         | 20      | 0  | 75.6 | 65 - 141                         | 16.69         | 9.9   | 20             |
| Vinyl chloride              | 15.8   | 1.0                         | 20      | 0  | 79.0 | 58 - 137                         | 17.21         | 8.56  | 20             |
| Surr: 1,2-Dichloroethane-d4 | 42.99  | 1.0                         | 50      | 0  | 86.0 | 81 - 118                         | 44.43         | 3.31  | 20             |
| Surr: 4-Bromofluorobenzene  | 48.96  | 1.0                         | 50      | 0  | 97.9 | 85 - 114                         | 49.85         | 1.81  | 20             |
| Surr: Dibromofluoromethane  | 44.46  | 1.0                         | 50      | 0  | 88.9 | 80 - 119                         | 45.28         | 1.83  | 20             |

ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**QC BATCH REPORT**

| Batch ID: R338352 ( 0 )  |                             | Instrument: VOA6 |                | Method: VOLATILES ORGANICS BY METHOD 8260C |           |               |               |        |           |      |
|--------------------------|-----------------------------|------------------|----------------|--|-----------|---------------|---------------|--------|-----------|------|
| <b>MSD</b>               | Sample ID: HS19050082-04MSD | Units: UG/L      |                | Analysis Date: 13-May-2019 22:09           |           |               |               |        |           |      |
| Client ID: 67WW11-190501 | Run ID: VOA6_338352         |                  | SeqNo: 5073722 |  | PrepDate: |               | DF: 1         |        |           |      |
| Analyte                  | Result                      | PQL              | SPK Val        | SPK Ref Value                              | %REC      | Control Limit | RPD Ref Value | %RPD   | RPD Limit | Qual |
| Surr: Toluene-d8         | 52.41                       | 1.0              | 50             | 0  | 105       | 89 - 112      | 52.44         | 0.0612 | 20        |      |

The following samples were analyzed in this batch:

|               |               |               |               |
|---------------|---------------|---------------|---------------|
| HS19050082-01 | HS19050082-02 | HS19050082-03 | HS19050082-04 |
| HS19050082-05 | HS19050082-06 | HS19050082-07 |               |



## ALS Houston, US

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

## QC BATCH REPORT

| Batch ID: R337814 ( 0 )  |                          | Instrument: ICS2100 |         | Method: ANIONS BY SW9056A        |      |               |               |      |                |
|--------------------------|--------------------------|---------------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| <b>MBLK</b>              | Sample ID: WBLKW2-050219 | Units: mg/L         |         | Analysis Date: 02-May-2019 21:41 |      |               |               |      |                |
| Client ID:               | Run ID: ICS2100_337814   | SeqNo: 5061734      |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                   | PQL                 | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 0.500                    | 0.500               |         |                                  |      |               |               |      | U              |
| Nitrogen, Nitrate (As N) | 0.100                    | 0.100               |         |                                  |      |               |               |      | U              |
| Sulfate                  | 0.500                    | 0.500               |         |                                  |      |               |               |      | U              |

| <b>LCS</b>               | Sample ID: WLCSW2-050219 | Units: mg/L    |         | Analysis Date: 02-May-2019 21:55 |      |               |               |      |                |
|--------------------------|--------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_337814   | SeqNo: 5061735 |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                   | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 20.13                    | 0.500          | 20      | 0                                | 101  | 80 - 120      |               |      |                |
| Nitrogen, Nitrate (As N) | 3.932                    | 0.100          | 4       | 0                                | 98.3 | 80 - 120      |               |      |                |
| Sulfate                  | 20.05                    | 0.500          | 20      | 0                                | 100  | 80 - 120      |               |      |                |

| <b>LCSD</b>              | Sample ID: WLCSDW2-050219 | Units: mg/L    |         | Analysis Date: 02-May-2019 22:10 |      |               |               |      |                |
|--------------------------|---------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_337814    | SeqNo: 5061736 |         | PrepDate:                        |      | DF: 1         |               |      |                |
| Analyte                  | Result                    | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 19.37                     | 0.500          | 20      | 0                                | 96.8 | 80 - 120      | 20.13         | 3.87 | 20             |
| Nitrogen, Nitrate (As N) | 3.798                     | 0.100          | 4       | 0                                | 95.0 | 80 - 120      | 3.932         | 3.47 | 20             |
| Sulfate                  | 19.23                     | 0.500          | 20      | 0                                | 96.2 | 80 - 120      | 20.05         | 4.17 | 20             |

| <b>MS</b>                | Sample ID: HS19041545-10MS | Units: mg/L    |         | Analysis Date: 03-May-2019 03:32 |      |               |               |      |                |
|--------------------------|----------------------------|----------------|---------|----------------------------------|------|---------------|---------------|------|----------------|
| Client ID:               | Run ID: ICS2100_337814     | SeqNo: 5061745 |         | PrepDate:                        |      | DF: 5         |               |      |                |
| Analyte                  | Result                     | PQL            | SPK Val | SPK Ref Value                    | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit Qual |
| Chloride                 | 65.95                      | 2.50           | 50      | 15.1                             | 102  | 80 - 120      |               |      |                |
| Nitrogen, Nitrate (As N) | 10.49                      | 0.500          | 10      | 1.055                            | 94.4 | 80 - 120      |               |      |                |
| Sulfate                  | 133.5                      | 2.50           | 50      | 78.44                            | 110  | 80 - 120      |               |      |                |



**ALS Houston, US**

Date: 17-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050082

**QUALIFIERS,  
ACRONYMS, UNITS**

| <b>Qualifier</b> | <b>Description</b>  |
|------------------|---|
| *                | Value exceeds Regulatory Limit  |
| a                | Not accredited  |
| B                | Analyte detected in the associated Method Blank above the Reporting Limit |
| E                | Value above quantitation range  |
| H                | Analyzed outside of Holding Time  |
| J                | Analyte detected below quantitation limit                                 |
| M                | Manually integrated, see raw data for justification                       |
| n                | Not offered for accreditation   |
| ND               | Not Detected at the Reporting Limit                                       |
| O                | Sample amount is > 4 times amount spiked                                  |
| P                | Dual Column results percent difference > 40%                              |
| R                | RPD above laboratory control limit  |
| S                | Spike Recovery outside laboratory control limits                          |
| U                | Analyzed but not detected above the MDL/SDL                               |

| <b>Acronym</b> | <b>Description</b>                  |
|----------------|-------------------------------------|
| DCS            | Detectability Check Study           |
| DUP            | Method Duplicate                    |
| LCS            | Laboratory Control Sample           |
| LCSD           | Laboratory Control Sample Duplicate |
| MBLK           | Method Blank                        |
| MDL            | Method Detection Limit              |
| MQL            | Method Quantitation Limit           |
| MS             | Matrix Spike                        |
| MSD            | Matrix Spike Duplicate              |
| PDS            | Post Digestion Spike                |
| PQL            | Practical Quantitation Limit        |
| SD             | Serial Dilution                     |
| SDL            | Sample Detection Limit              |
| TRRP           | Texas Risk Reduction Program        |

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**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

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| Agency          | Number            | Expire Date |
|-----------------|-------------------|-------------|
| Illinois        | 004438            | 29-Jun-2019 |
| Louisiana       | 03087             | 30-Jun-2019 |
| Dept of Defense | ANAB L2231        | 20-Dec-2021 |
| Kansas          | E-10352 2018-2019 | 31-Jul-2019 |
| Oklahoma        | 2018-156          | 31-Aug-2019 |
| North Carolina  | 624-2019          | 31-Dec-2019 |
| Maryland        | 343, 2018-2019    | 30-Jun-2019 |
| Arkansas        | 19-028-0          | 27-Mar-2020 |
| Texas           | TX104704231-19-23 | 30-Apr-2020 |

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ALS Houston, US

Date: 17-May-19

## Sample Receipt Checklist

Client Name: CBI-Houston  
Work Order: HS19050082

Date/Time Received: **02-May-2019 08:51**  
Received by: **NDR**

Checklist completed by: Raegen Giga 2-May-2019  
eSignature Date

Reviewed by: Corey Grandits 2-May-2019  
eSignature Date

Matrices: **GW**Carrier name: **FedEx Priority Overnight**

|   |   |  |   |
|---|---|--|---|
| Shipping container/cooler in good condition?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on shipping container/cooler?      | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on sample bottles?                 | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | Not Present <input checked="" type="checkbox"/> |
| VOA/TX1005/TX1006 Solids in hermetically sealed vials?  | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | 1 Page(s)                                       |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Samplers name present on COC?                           | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Chain of custody agrees with sample labels?             | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |   |
| Samples in proper container/bottle?                     | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Sample containers intact?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Sufficient sample volume for indicated test?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| All samples received within holding time?               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Container/Temp Blank temperature in compliance?         | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |

Temperature(s)/Thermometer(s):

1.5c/ uc/c IR 11

Cooler(s)/Kit(s):

44900

Date/Time sample(s) sent to storage:

05/02/2019 11:15

Water - VOA vials have zero headspace?

Yes ☒ No ☐ No VOA vials submitted ☐

Water - pH acceptable upon receipt?

Yes ☒ No ☐ N/A ☐

pH adjusted?

Yes ☐ No ☒ N/A ☐

pH adjusted by:

Login Notes: 67WW02-190501 - COC = 3 vials , Rec'd 6 HCL Vials for this sample

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

Corrective Action:

| APTIM                                    |                   | Page 1 of                |           |            |              |                              |             |                                 |                                    |                  |                 |                         |                             |                                      |                           |   |
|--|-------------------|--------------------------|-----------|------------|--------------|------------------------------|-------------|---------------------------------|------------------------------------|------------------|-----------------|-------------------------|-----------------------------|--------------------------------------|---------------------------|---|
| COC ID:                                  |                   | LHAAP67-MAY2019-ALS      |           |            |              | TURNAROUND TIME:             |             |                                 |                                    | RUSH:            |                 |                         |                             |                                      |                           |   |
| PROJECT/CLIENT INFO                      |                   |                          |           |            |              |                              |             | LABORATORY                      |                                    |                  |                 | OTHER INFO              |                             |                                      |                           |   |
| Facility Name                            | Loughorn AAP      |                          |           |            | Lab Name     | ALS Laboratories             |             |                                 |                                    | Email Invoice To |                 |                         |                             | FedInvoices@aptim.com                |                           |   |
| Project Number                           | 501032            |                          |           |            | Lab Contact  | RJ Modashia                  |             |                                 |                                    | Email Report To  |                 |                         |                             | Susan.Huang@aptim.com                |                           |   |
| Address                                  |                   | 1203-B East Grand Avenue |           |            |              | Email                        |             | Rj.Modashia@alsglobal.com       |                                    |                  |                 | Mail Reports To         |                             | Susan Huang                          |                           |   |
| PMB 202                                  |                   |                          |           |            |              | Address                      |             | 10450 Stanciliff Rd., Suite 210 |                                    |                  |                 | Address                 |                             | 4005 Port Chicago Highway, Suite 200 |                           |   |
| City                                     | Marshall          | State                    | TX        |            | City         | Houston                      | State       | TX                              |                                    | City             |                 | Concord                 | State                       | CA                                   |                           |   |
| Postal Code                              | 75670             |                          | Country   | USA        |              | Postal Code                  | 77099       |                                 | Country                            | USA              |                 | Postal Code             | 94520                       |                                      |                           |   |
| Phone Number                             | 713.243.7264      |                          |           |            | Phone Number | 281.575.2279 or 281.530.5656 |             |                                 |                                    | Shipping Company |                 |                         |                             |                                      |                           |   |
| Project Manager                          | Praveen Srivastav |                          |           |            |              |                              |             |                                 |                                    |                  |                 |                         |                             |                                      |                           |   |
| SAMPLE DETAILS                           |                   |                          |           |            |              |                              |             | ANALYSIS REQUESTED              |                                    |                  |                 |                         |                             |                                      |                           |   |
| Sample ID                                | Location          | Start Depth              | End Depth | Depth Unit | Field Matrix | Date                         | Time (24hr) | # Of Cont.                      | Sample Container and Preservatives | ANALYSIS         | 3-40 ml VOA/HCL | 3-40 ml VOA/HCL         | 3-40 ml VOA/Cool to 6 deg C | 2-40ml Amber/H2SO4                   | 1-250ml (Cool to 6 deg C) | Anions (chloride/sulfate/nitrate) by 9056 |
| 67WW13-190501                            | LHAAP 67          | 20.18                    | 20.40     |            | WG           | 5/1/19                       | 0800        | 12                              |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| 67WW13-190501-FD                         | LHAAP 67          | 20.18                    | 20.40     |            | WG           | 5/1/19                       | 0800        | 12                              |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| 67WW08-190501                            | LHAAP 67          | 21.67                    | 21.90     |            | WG           | 5/1/19                       | 0900        | 12                              |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| 67WW11-190501                            | LHAAP 67          | 21.21                    | 21.44     |            | WG           | 5/1/19                       | 0955        | 3                               |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| 67WW16T-190501                           | LHAAP 67          | 21.80                    | 21.98     |            | WG           | 5/1/19                       | 1045        | 3                               |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| 67WW02-190501                            | LHAAP 67          | 22.42                    | 26.67     |            | WG           | 5/1/19                       | 1135        | 3                               |                                    | Vocs by 8260B    | X               | X                       | X                           | X                                    | X                         |   |
| TRIP BLANK                               | LHAAP 67          |                          |           |            | W            | 5/1/19                       |             | 2                               |                                    | Vocs by 8260B    | X               |                         |                             |                                      |                           |   |
| ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS |                   |                          |           |            |              |                              |             | RELINQUISHED BY/AFFILIATION     |                                    | DATE/TIME        |                 | ACCEPTED BY/AFFILIATION |                             | DATE/TIME                            |                           |   |
|  |                   |                          |           |            |              |                              |             | Santosh Singh/BHATE             |                                    | 5/1/19 1245      |                 | NA                      |                             | S.2.19 08.51                         |                           |   |
|  |                   |                          |           |            |              |                              |             |                                 |                                    |                  |                 |                         |                             |                                      |                           |   |
|  |                   |                          |           |            |              |                              |             |                                 |                                    |                  |                 |                         |                             |                                      |                           |   |

HS19050082

Aptim Environmental & Infrastructure, Inc.  
Loughorn Army Ammunition Plant



44900 44900 207 Temp. UIC 1.5.  
52.9  
IRN 11 C/A 7

# XH SGRA

77099  
TX-US  
IAH



ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED  
DATE 03-23-2011 BY 60322 UCBAW



10450 Stancliff Rd., Suite 210  
Houston, Texas 77099  
Tel. +1 281 530 5656  
Fax. +1 281 530 5887

**CUSTODY SEAL**

Date: 5/1/19 Time: \_\_\_\_\_  
Name: Scott Bles  
Company: B N A

Seal Broken By

DATE: 11/11/19





2655 Park Center Dr., Suite A  
Simi Valley, CA 93065  
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[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

May 17, 2019

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road Suite 210  
Houston, TX 77099-4338

**RE: HS19050082**

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on May 3, 2019. For your reference, these analyses have been assigned our service request number P1902518.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Hayden Akers at 11:12, May 17, 2019

Hayden Akers  
Project Manager



2655 Park Center Dr., Suite A  
 Simi Valley, CA 93065  
 T: +1 805 526 7161  
[www.alsglobal.com](http://www.alsglobal.com)

Client: ALS Laboratory Group  
 Project: HS19050082

Service Request No: P1902518

## CASE NARRATIVE

The samples were received intact under chain of custody on May 3, 2019 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Carbon Dioxide Analysis

The samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

### Methane, Ethene and Ethane Analysis

The samples were also analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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[www.alsglobal.com](http://www.alsglobal.com)

### ALS Environmental – Simi Valley

#### CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

| Agency                 | Web Site  | Number                     |
|------------------------|---|----------------------------|
| Alaska DEC             | <a href="http://dec.alaska.gov/eh/lab.aspx">http://dec.alaska.gov/eh/lab.aspx</a>   | 17-019                     |
| Arizona DHS            | <a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a> | AZ0694                     |
| Florida DOH (NELAP)    | <a href="http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html">http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html</a>   | E871020                    |
| Louisiana DEQ (NELAP)  | <a href="http://www.deq.louisiana.gov/page/la-lab-accreditation">http://www.deq.louisiana.gov/page/la-lab-accreditation</a>   | 05071                      |
| Maine DHHS             | <a href="http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml">http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml</a>   | 2018027                    |
| Minnesota DOH (NELAP)  | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>   | 1521096                    |
| New Jersey DEP (NELAP) | <a href="http://www.nj.gov/dep/enforcement/oqa.html">http://www.nj.gov/dep/enforcement/oqa.html</a>   | CA009                      |
| New York DOH (NELAP)   | <a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>   | 11221                      |
| Oregon PHD (NELAP)     | <a href="http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>                           | 4068-006                   |
| Pennsylvania DEP       | <a href="http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx">http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx</a>   | 68-03307<br>(Registration) |
| PJLA (DoD ELAP)        | <a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>   | 65818<br>(Testing)         |
| Texas CEQ (NELAP)      | <a href="http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html</a>   | T104704413-18-9            |
| Utah DOH (NELAP)       | <a href="http://health.utah.gov/lab/lab_cert_env">http://health.utah.gov/lab/lab_cert_env</a>   | CA016272018-9              |
| Washington DOE         | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>   | C946                       |

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

## ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: ALS Laboratory Group  
Project ID: HS19050082

Service Request: P1902518

Date Received: 5/3/2019  
Time Received: 09:04

| Client Sample ID | Lab Code     | Matrix | Date Collected | Time Collected | RSK 175 - CO2 | RSK 175 - Gases |
|------------------|--------------|--------|----------------|----------------|---------------|-----------------|
| 67WW13-190501    | P1902518-001 | Water  | 5/1/2019       | 08:00          | X             | X               |
| 67WW13-190501 FD | P1902518-002 | Water  | 5/1/2019       | 08:00          | X             | X               |
| 67WW08-190501    | P1902518-003 | Water  | 5/1/2019       | 08:00          | X             | X               |



10450 Standcliff Rd, Ste 210  
Houston, TX 77099  
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www.alsglobal.com

## Subcontract Chain of Custody

P1902518

**SAMPLING STATE:** Texas

**COC ID:** 11237

### SUBCONTRACT TO:

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

**Phone:** +1 805 526 7161

### CUSTOMER INFORMATION:

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Standcliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

### INVOICE INFORMATION:

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Standcliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS19050082  
**TSR:** Sonia West

|    | LAB SAMPLE ID                                      | CLIENT SAMPLE ID | MATRIX      | COLLECT DATE      |
|----|--|------------------|-------------|-------------------|
|    | ANALYSIS REQUESTED                                 |                  |             | DUE DATE          |
| 1. | HS19050082-01                                      | 67WW13-190501    | Groundwater | 01 May 2019 08:00 |
|    | MEE + CO2. DOD IV. Equis EDD. EQUIS 5.0 - Longhorn |                  |             | 16 May 2019       |
| 2. | HS19050082-02                                      | 67WW13-190501 FD | Groundwater | 01 May 2019 08:00 |
|    | MEE + CO2. DOD IV. Equis EDD. EQUIS 5.0 - Longhorn |                  |             | 16 May 2019       |
| 3. | HS19050082-03                                      | 67WW08-190501    | Groundwater | 01 May 2019 08:00 |
|    | MEE + CO2. DOD IV. Equis EDD. EQUIS 5.0 - Longhorn |                  |             | 16 May 2019       |

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)

Relinquished By:

Date/Time:

5/2/19 1800

Received By:

Date/Time:

5-3-19 0904

Cooler ID(s):

Temperature(s):

RIGHT SOLUTIONS | RIGHT PARTNER



10450 Stancliff Rd, Ste 210  
Houston, TX 77099  
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F: +1 281 530 5887  
www.alsglobal.com

## Purchase Order

PI902518

PO: HS19050082

### VENDOR:

ALS Environmental  
2655 Park Center Drive, Suite A  
Simi Valley, CA 93065

Phone: +1 805 526 7161

### CUSTOMER INFORMATION:

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate  
Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

### INVOICE INFORMATION:

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** 11237  
**TSR:** Sonia West

| Item   | Catalog No | Unit Price | Quantity | Ext Price       |
|--|------------|------------|----------|-----------------|
| 1. MEE + CO2. DOD IV. Equis<br>EDD. EQUIS 5.0 - Longhorn | NA         | \$41.25    | 3        | \$123.75        |
| <b>Order Total:</b>                                      |            |            |          | <b>\$123.75</b> |

# **ALS Environmental** **Sample Acceptance Check Form**

Client: ALS Laboratory Group Work order: P1902518  
 Project: HS190500823  
 Sample(s) received on: 5/3/19 Date opened: 5/3/19 by: CHRIS.GLEASON

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

|   | <u>Yes</u>                          | <u>No</u>                           | <u>N/A</u>                          |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Did <b>sample container labels</b> and/or tags agree with custody papers?                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature: 3° C    Blank Temperature: ° C    Thermometer ID T-111    Wet Ice                           |                                     |                                     |                                     |
| 8 Were <b>custody seals</b> on outside of cooler/Box/Container?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Location of seal(s)? <u>Sealing Lid of Cooler</u> Sealing Lid?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Were signature and date included?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Were seals intact?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?       | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 10 <b>Tubes:</b> Are the tubes capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 <b>Badges:</b> Are the badges properly capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

| Lab Sample ID   | Container Description | Required pH * | Received pH | Adjusted pH | VOA Headspace (Presence/Absence) | Receipt / Preservation Comments |
|-----------------|-----------------------|---------------|-------------|-------------|----------------------------------|---------------------------------|
| P1902518-001.01 | 40mL VOA NP           |               | 7           |             | A                                | wh 5/13/19                      |
| P1902518-001.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1902518-001.03 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1902518-001.04 | 40ml VOA HCL          |               | 1           |             | A                                | wh 5/7/19                       |
| P1902518-001.05 | 40ml VOA HCL          |               |             |             | A                                |                                 |
| P1902518-001.06 | 40ml VOA HCL          |               |             |             | A                                |                                 |
| P1902518-002.01 | 40mL VOA NP           |               | 7           |             | A                                | wh 5/13/19                      |
| P1902518-002.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1902518-002.03 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1902518-002.04 | 40ml VOA HCL          |               | 1           |             | A                                | wh 5/7/19                       |
| P1902518-002.05 | 40ml VOA HCL          |               |             |             | A                                |                                 |
| P1902518-002.06 | 40ml VOA HCL          |               |             |             | A                                |                                 |
| P1902518-003.01 | 40mL VOA NP           |               | 7           |             | A                                | wh 5/13/19                      |
| P1902518-003.02 | 40mL VOA NP           |               |             |             | A                                |                                 |
| P1902518-003.03 | 40mL VOA NP           |               |             |             | A                                |                                 |

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_



## ALS Environmental Sample Acceptance Check Form

|                                      |   |
|--------------------------------------|---|
| Client: <u>ALS Laboratory Group</u>  | Work order: <u>P1902518</u>                         |
| Project: <u>HS190500823</u>          |   |
| Sample(s) received on: <u>5/3/19</u> | Date opened: <u>5/3/19</u> by: <u>CHRIS.GLEASON</u> |

[illegible]

Explain any discrepancies: (include lab sample ID numbers):

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

Client: **ALS Laboratory Group**Client Project ID: **HS19050082**

ALS Project ID: P1902518

**Carbon Dioxide**

Test Code: RSK 175

Instrument ID: HP5890A/GC10/TCD

Analyst: Wade Henton

Matrix: Water

Test Notes:

Date(s) Collected: 5/1/19

Date Received: 5/3/19

Date Analyzed: 5/13/19

| Client Sample ID      | ALS Sample ID | Injection<br>Volume<br>ml(s) | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|-----------------------|---------------|------------------------------|----------------|-------------|-------------|-------------|-------------------|
| 67WW13-190501         | P1902518-001  | 0.050                        | <b>840,000</b> | 2,000       | 1,700       | 740         |                   |
| 67WW13-190501 FD      | P1902518-002  | 0.050                        | <b>860,000</b> | 2,000       | 1,700       | 740         |                   |
| 67WW08-190501         | P1902518-003  | 0.050                        | <b>270,000</b> | 2,000       | 1,700       | 740         |                   |
| Method Control Sample | P190513-MB    | 0.10                         | 860            | 1,000       | 860         | 370         | <b>U</b>          |

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS19050082

ALS Project ID: P1902518  
 ALS Sample ID: P190513-DLCS

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/TCD  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 5/13/19  
 Volume(s) Analyzed: NA ml(s)

| CAS #    | Compound       | Spike Amount       | Result <sub>i</sub> |              | % Recovery |      | DOD                  | RPD | RPD | Data      |
|----------|----------------|--------------------|---------------------|--------------|------------|------|----------------------|-----|-----|-----------|
|          |                | LCS / DLCS<br>ug/L | LCS<br>ug/L         | DLCS<br>ug/L | LCS        | DLCS | Acceptance<br>Limits |     |     |           |
| 124-38-9 | Carbon Dioxide | 22,900             | 19,300              | 20,200       | 84         | 88   | 80-122               | 5   | 12  | Qualifier |

<sub>i</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group**Client Sample ID:** 67WW13-190501**Client Project ID:** HS19050082

ALS Project ID: P1902518

ALS Sample ID: P1902518-001

**Test Code:** RSK 175**Instrument ID:** HP5890A/GC10/FID**Analyst:** Wade Henton**Matrix:** Water**Test Notes:****Date Collected:** 5/1/19**Date Received:** 5/3/19**Date Analyzed:** 5/7/19**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 1.0            | 1.3         | 1.0         | 0.51        | U                 |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | U                 |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | U                 |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 67WW13-190501 FD  
**Client Project ID:** HS19050082

ALS Project ID: P1902518  
ALS Sample ID: P1902518-002

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/FID  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** 5/1/19  
**Date Received:** 5/3/19  
**Date Analyzed:** 5/7/19  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 1.0            | 1.3         | 1.0         | 0.51        | U                 |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | U                 |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | U                 |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** 67WW08-190501  
**Client Project ID:** HS19050082

ALS Project ID: P1902518  
ALS Sample ID: P1902518-003

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/FID  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** 5/1/19  
**Date Received:** 5/3/19  
**Date Analyzed:** 5/7/19  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 2.5            | 1.3         | 1.0         | 0.51        |                   |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | U                 |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | U                 |

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

## ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Method Control Sample  
**Client Project ID:** HS19050082

ALS Project ID: P1902518  
ALS Sample ID: P190507-MB

**Test Code:** RSK 175  
**Instrument ID:** HP5890A/GC10/FID  
**Analyst:** Wade Henton  
**Matrix:** Water  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 5/07/19  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #   | Compound | Result<br>µg/L | LOQ<br>µg/L | LOD<br>µg/L | MDL<br>µg/L | Data<br>Qualifier |
|---------|----------|----------------|-------------|-------------|-------------|-------------------|
| 74-82-8 | Methane  | 1.0            | 1.3         | 1.0         | 0.51        | U                 |
| 74-85-1 | Ethene   | 0.55           | 1.0         | 0.55        | 0.24        | U                 |
| 74-84-0 | Ethane   | 0.47           | 0.60        | 0.47        | 0.16        | U                 |

The Method Control Sample is laboratory water carried through the entire analytical process.

U = Compound was analyzed for, but not detected above the laboratory detection limit.

LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



## ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** ALS Laboratory Group  
**Client Sample ID:** Duplicate Lab Control Sample  
**Client Project ID:** HS19050082

ALS Project ID: P1902518  
 ALS Sample ID: P190507-LCS  
 P190507-DLCS

Test Code: RSK 175  
 Instrument ID: HP5890A/GC10/FID  
 Analyst: Wade Henton  
 Matrix: Water  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 5/07/19  
 Volume(s) Analyzed: 0.10 ml(s)

| CAS #   | Compound | Spike Amount       | Result <sub>1</sub> |              | % Recovery |            | DOD                  | RPD | RPD | Data |
|---------|----------|--------------------|---------------------|--------------|------------|------------|----------------------|-----|-----|------|
|         |          | LCS / DLCS<br>µg/L | LCS<br>µg/L         | DLCS<br>µg/L | LCS        | DLCS       | Acceptance<br>Limits |     |     |      |
| 74-82-8 | Methane  | 2.50               | 2.53                | 2.52         | <b>101</b> | <b>101</b> | 73-125               | 0   | 26  |      |
| 74-85-1 | Ethene   | 4.37               | 4.41                | 4.54         | <b>101</b> | <b>104</b> | 72-133               | 3   | 11  |      |
| 74-84-0 | Ethane   | 4.69               | 4.59                | 4.77         | <b>98</b>  | <b>102</b> | 74-131               | 4   | 10  |      |

<sub>1</sub> = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131907.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:13:16  
Operator : WH  
Sample : P1902518-001 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 12:34:14 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units    |
|--------------------|--------|----------|---------------|
| -----              |        |          |               |
| Target Compounds   |        |          |               |
| 1) Oxygen/Argon    | 1.972f | 1155474  | 0.243 ppm     |
| 2) Carbon monoxide | 1.972f | 1155474  | N.D. ppm      |
| 3) Methane (TCD)   | 0.000  | 0        | N.D. ppm      |
| 4) Carbon dioxide  | 5.997  | 4505713  | 19195.365 ppm |
| 6) Methane (FID)   | 0.000  | 0        | N.D. ppm      |
| 7) Ethylene        | 0.000  | 0        | N.D. ppm      |
| 8) Ethane          | 0.000  | 0        | N.D. ppm      |
| 9) Propylene       | 0.000  | 0        | N.D. ppm      |
| 10) Propane        | 0.000  | 0        | N.D. ppm      |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm      |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm      |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm      |
| -----              |        |          |               |

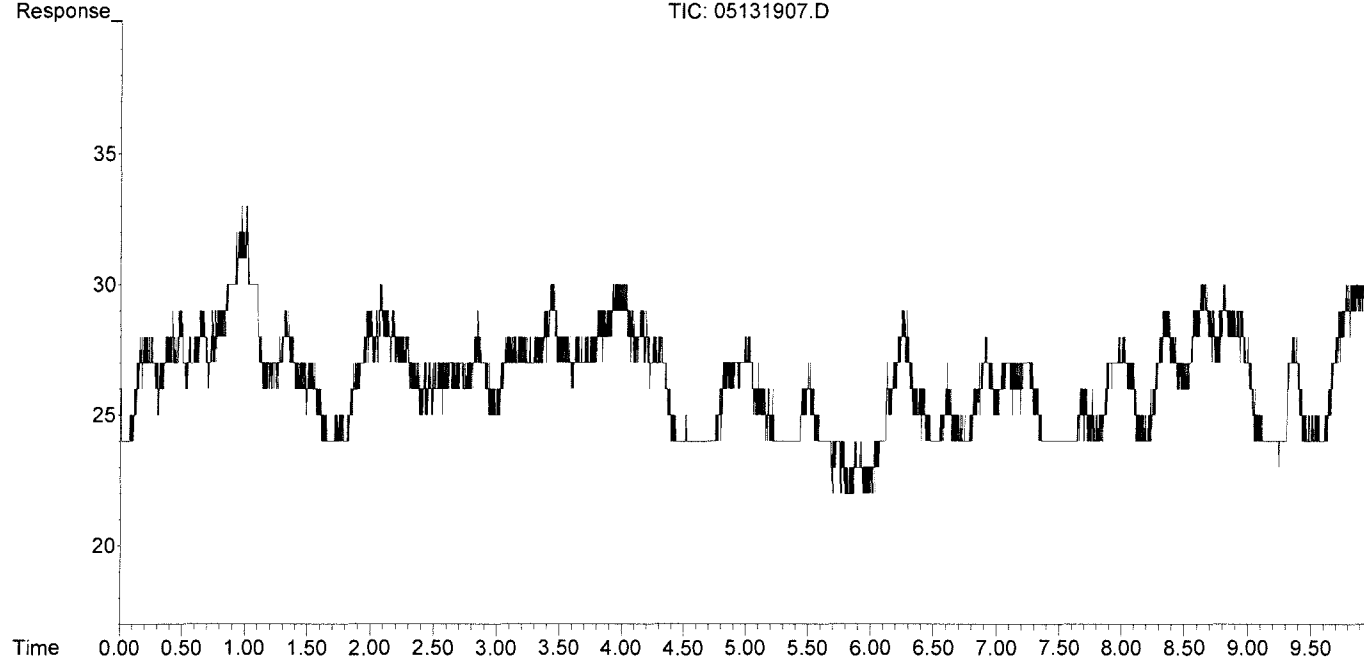
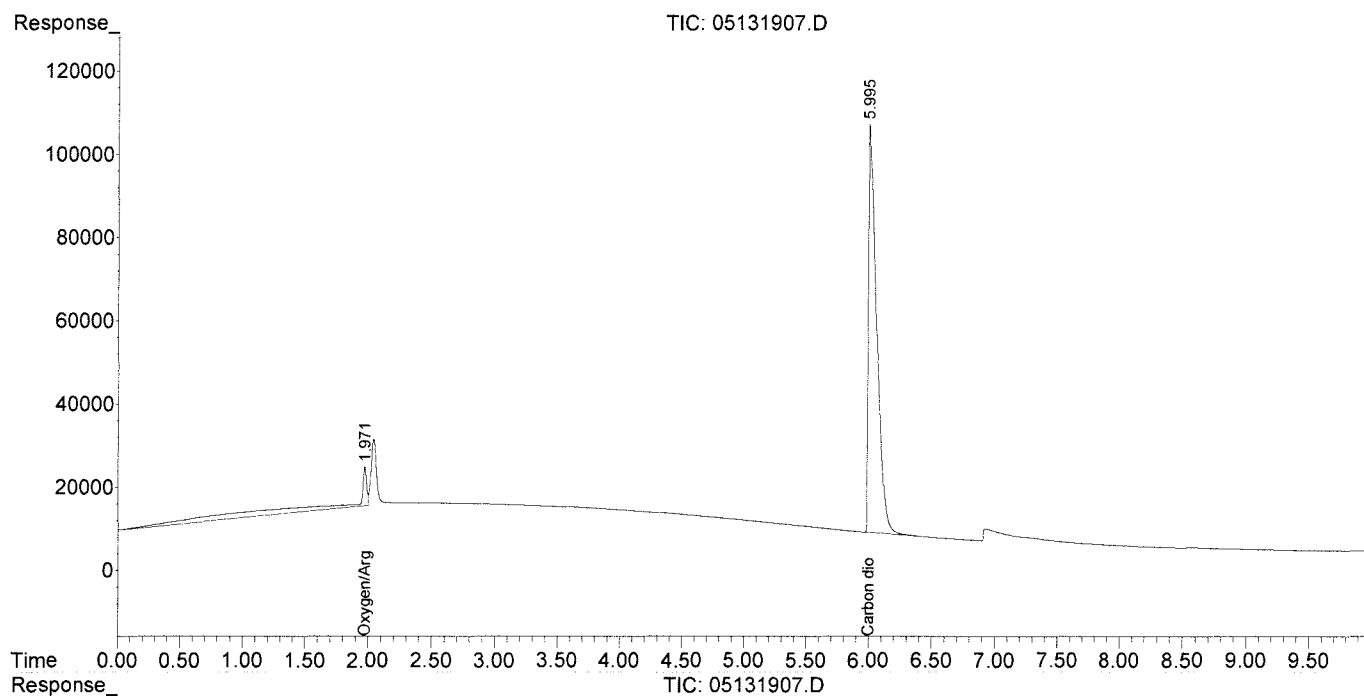
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(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131907.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:13:16  
Operator : WH  
Sample : P1902518-001 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 12:34:14 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131908.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:26:26  
Operator : WH  
Sample : P1902518-002 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 12:34:26 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units    |
|--------------------|--------|----------|---------------|
| -----              |        |          |               |
| Target Compounds   |        |          |               |
| 1) Oxygen/Argon    | 1.982f | 1162636  | 0.244 ppm     |
| 2) Carbon monoxide | 1.982f | 1162636  | N.D. ppm      |
| 3) Methane (TCD)   | 0.000  | 0        | N.D. ppm      |
| 4) Carbon dioxide  | 5.997  | 4628903  | 19720.184 ppm |
| 6) Methane (FID)   | 0.000  | 0        | N.D. ppm      |
| 7) Ethylene        | 0.000  | 0        | N.D. ppm      |
| 8) Ethane          | 0.000  | 0        | N.D. ppm      |
| 9) Propylene       | 0.000  | 0        | N.D. ppm      |
| 10) Propane        | 0.000  | 0        | N.D. ppm      |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm      |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm      |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm      |
| -----              |        |          |               |

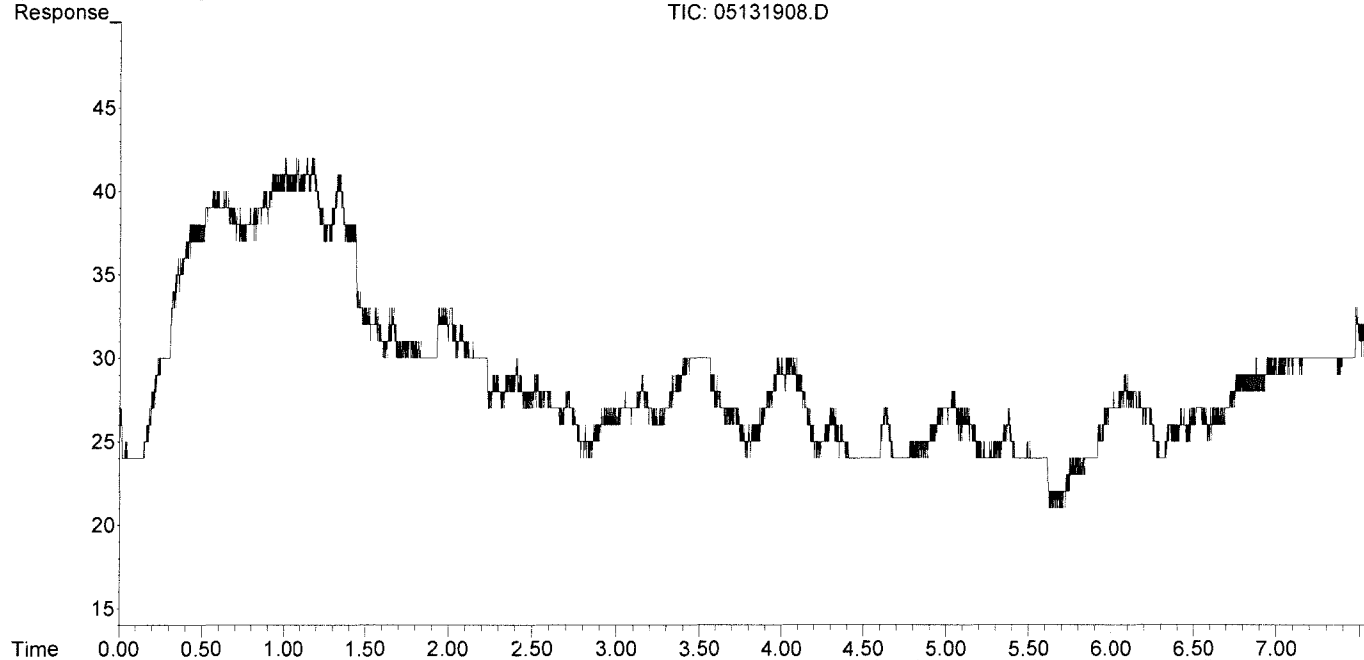
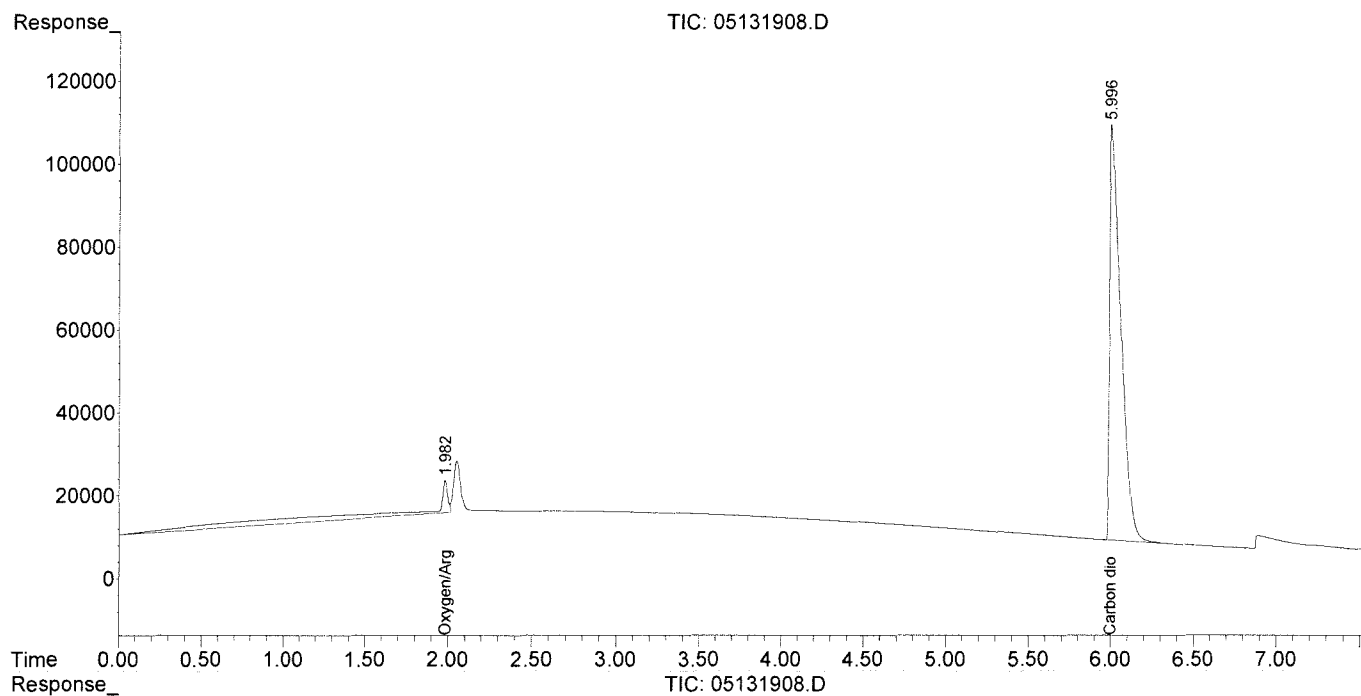
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131908.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:26:26  
Operator : WH  
Sample : P1902518-002 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 12:34:26 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131909.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:36:10  
Operator : WH  
Sample : P1902518-003 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 14 11:35:45 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units   |
|--------------------|--------|----------|--------------|
| -----              |        |          |              |
| Target Compounds   |        |          |              |
| 1) Oxygen/Argon    | 1.976f | 1189741  | 0.250 ppm    |
| 2) Carbon monoxide | 1.976f | 1189741  | N.D. ppm     |
| 3) Methane (TCD)   | 0.000  | 0        | N.D. ppm     |
| 4) Carbon dioxide  | 6.042  | 1468406  | 6255.744 ppm |
| 6) Methane (FID)   | 0.000  | 0        | N.D. ppm     |
| 7) Ethylene        | 0.000  | 0        | N.D. ppm     |
| 8) Ethane          | 0.000  | 0        | N.D. ppm     |
| 9) Propylene       | 0.000  | 0        | N.D. ppm     |
| 10) Propane        | 0.000  | 0        | N.D. ppm     |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm     |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm     |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm     |
| -----              |        |          |              |

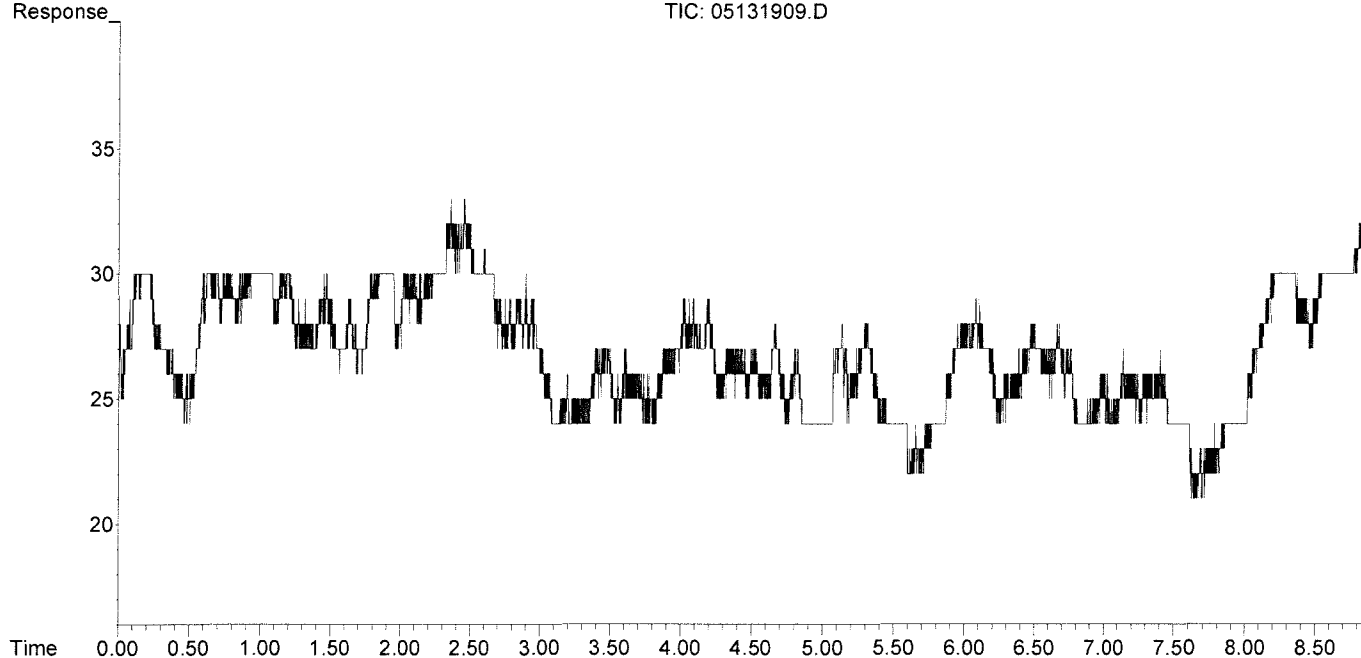
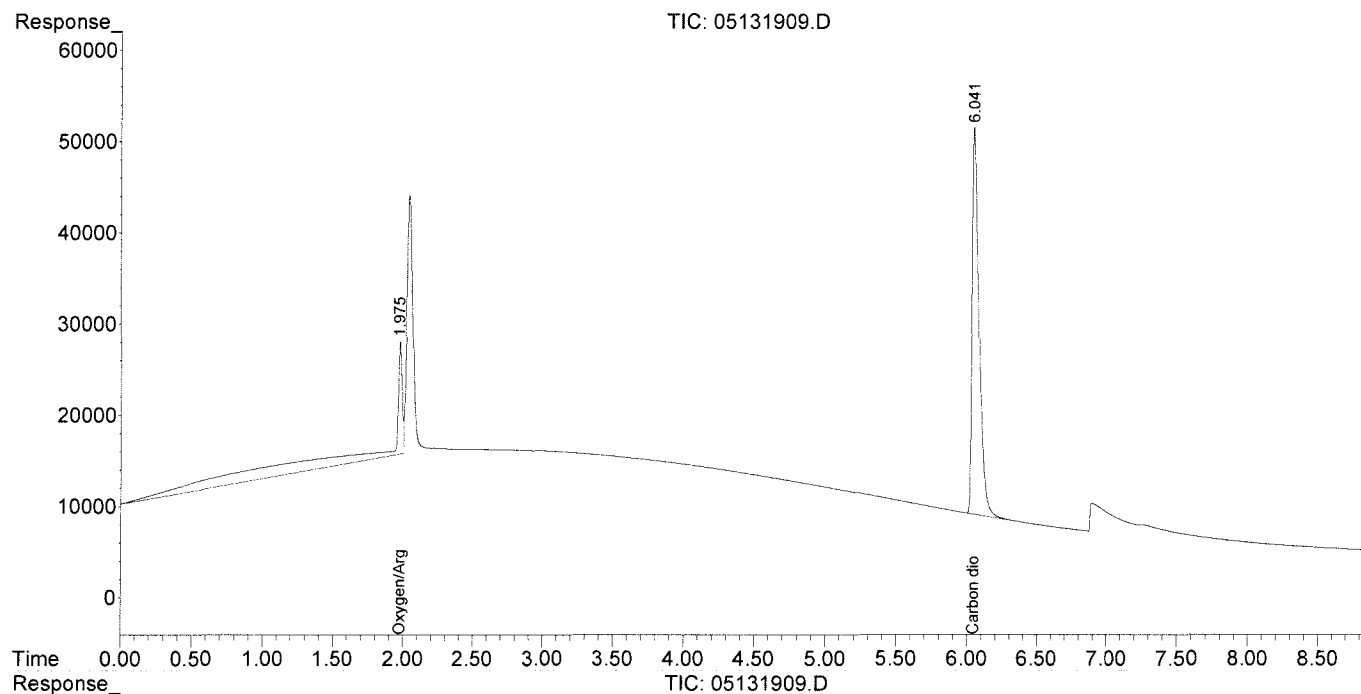
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131909.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 12:36:10  
Operator : WH  
Sample : P1902518-003 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 14 11:35:45 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131903.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:08:12  
Operator : WH  
Sample : mcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 14 10:48:07 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc | Units |
|--------------------|-------|----------|------|-------|
| -----              |       |          |      |       |
| Target Compounds   |       |          |      |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D. | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D. | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D. | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D. | ppm   |
| 6) Methane (FID)   | 0.000 | 0        | N.D. | ppm   |
| 7) Ethylene        | 0.000 | 0        | N.D. | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D. | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D. | ppm   |
| 10) Propane        | 0.000 | 0        | N.D. | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D. | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D. | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D. | ppm   |
| -----              |       |          |      |       |

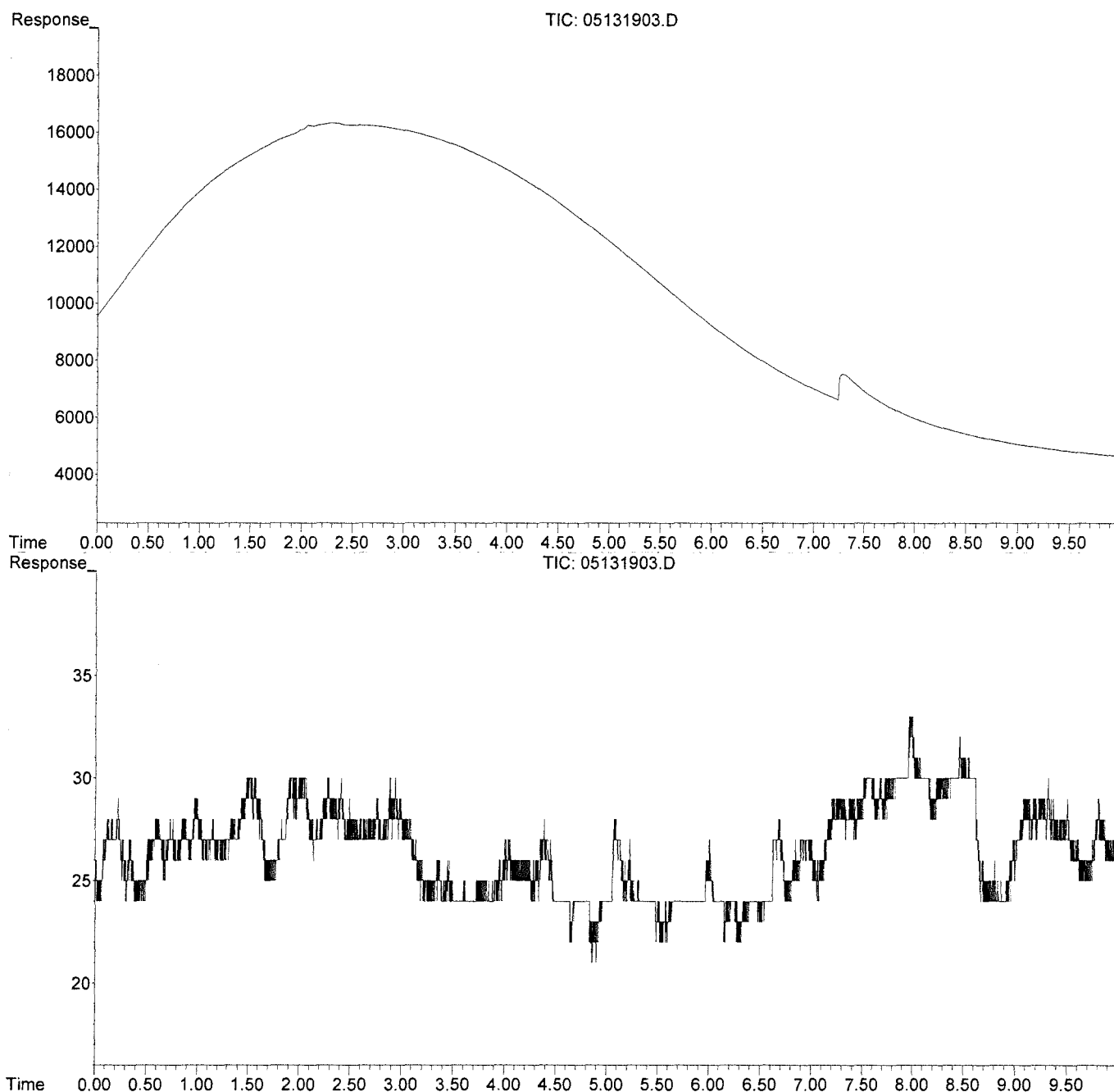
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131903.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:08:12  
Operator : WH  
Sample : mcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 14 10:48:07 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131904.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:26:21  
Operator : WH  
Sample : lcs tcd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 11:36:14 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc    | Units |
|--------------------|--------|----------|---------|-------|
| -----              |        |          |         |       |
| Target Compounds   |        |          |         |       |
| 1) Oxygen/Argon    | 1.965f | 612499   | 0.129   | ppm   |
| 2) Carbon monoxide | 1.965f | 612499   | N.D.    | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.    | ppm   |
| 4) Carbon dioxide  | 6.062  | 207232   | 882.856 | ppm m |
| 6) Methane (FID)   | 0.000  | 0        | N.D.    | ppm   |
| 7) Ethylene        | 0.000  | 0        | N.D.    | ppm   |
| 8) Ethane          | 0.000  | 0        | N.D.    | ppm   |
| 9) Propylene       | 0.000  | 0        | N.D.    | ppm   |
| 10) Propane        | 0.000  | 0        | N.D.    | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.    | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.    | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.    | ppm   |
| -----              |        |          |         |       |

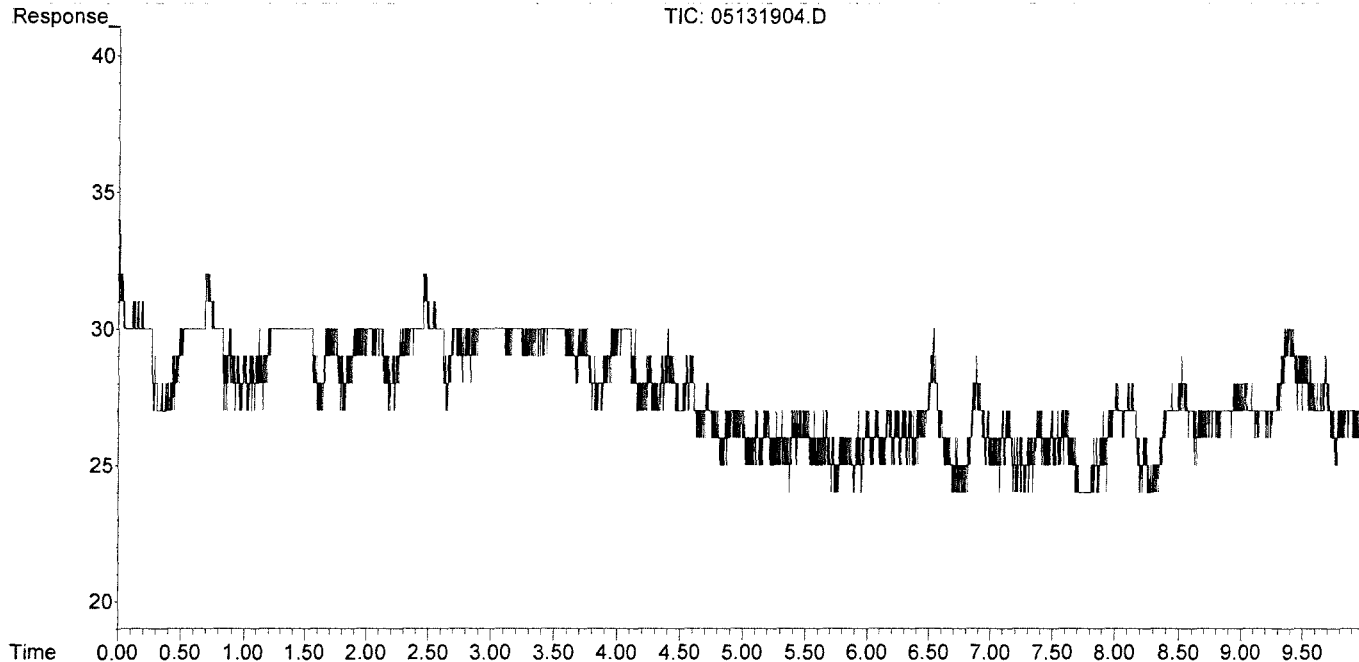
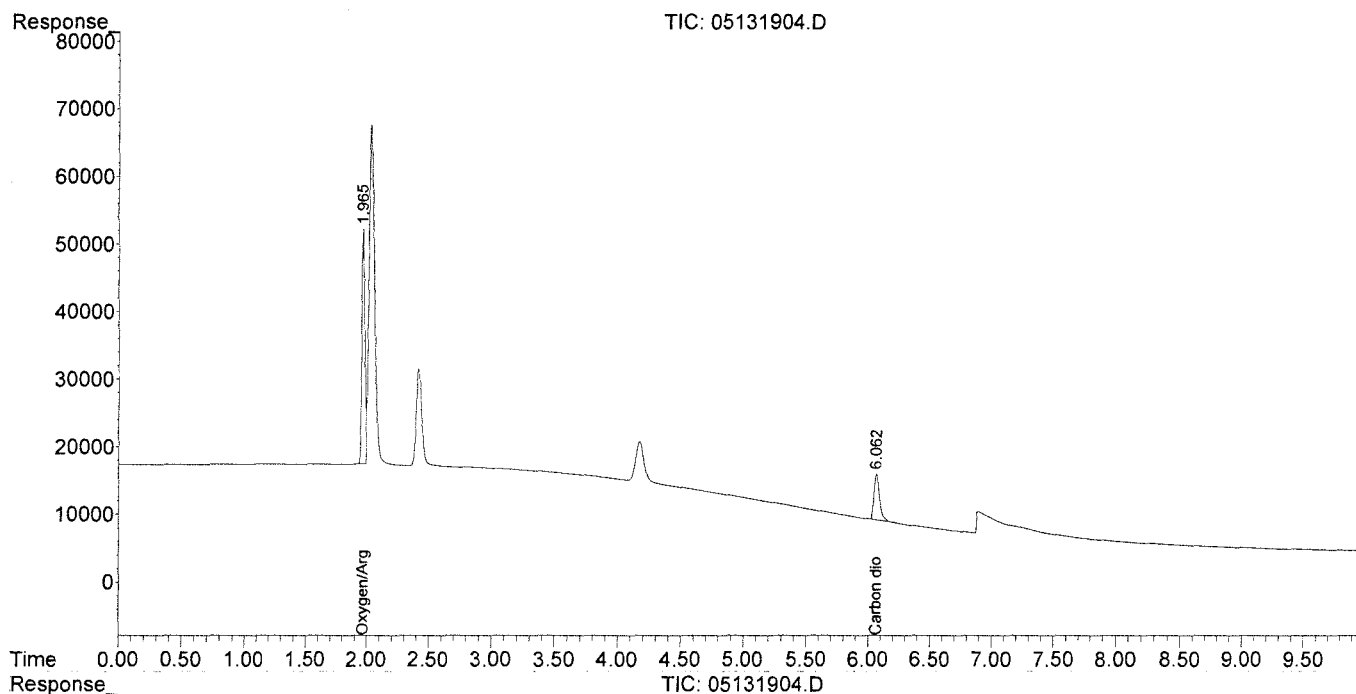
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131904.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:26:21  
Operator : WH  
Sample : lcs tcd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 11:36:14 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

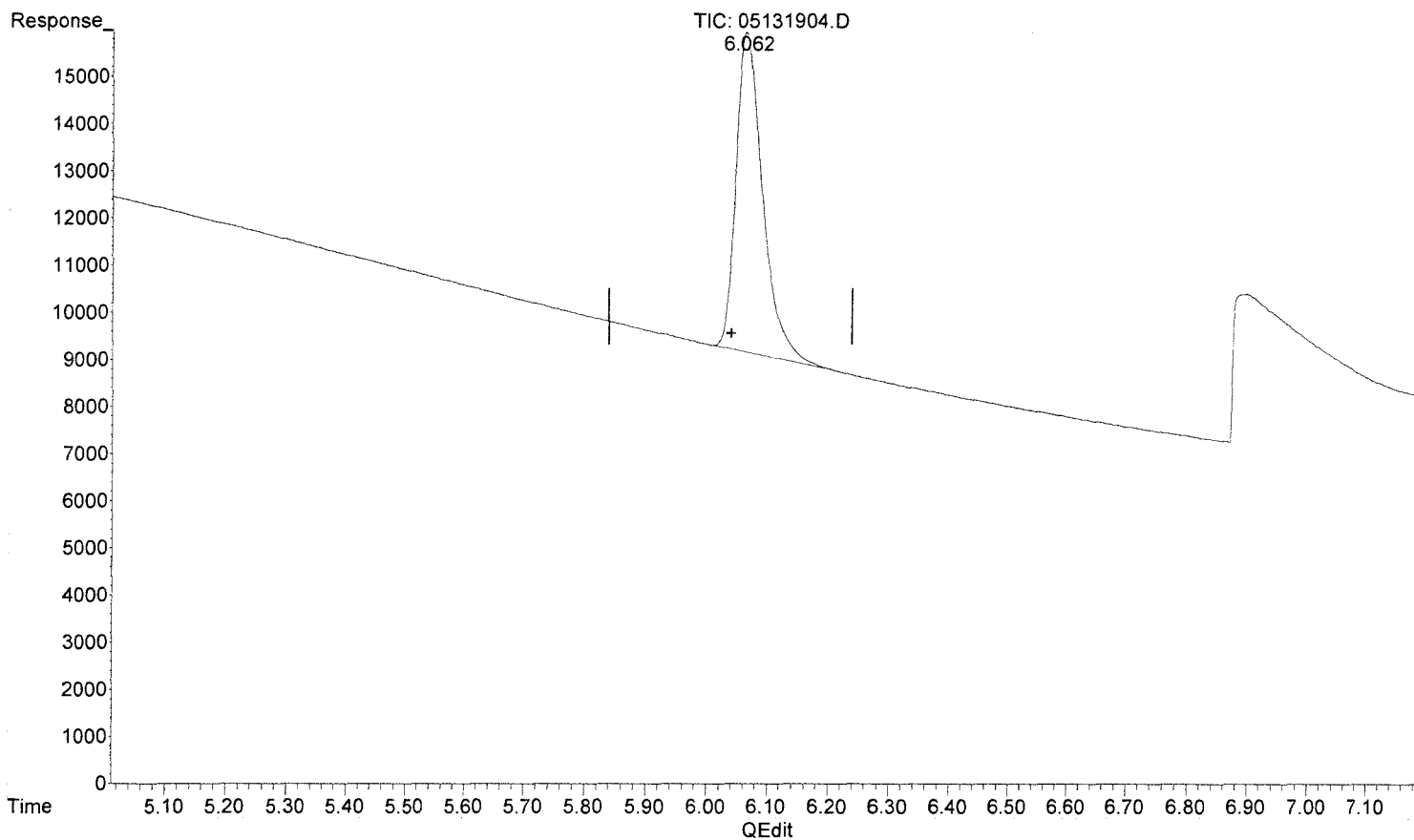
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131904.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:26:21  
Operator : WH  
Sample : lcs tcd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 11:36:14 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide

6.062min 882.856 ppm m

response 207232

MR  
5/14/19

Let's check  
Buc  
no previous

(+) = Expected Retention Time

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
 Data File : 05131905.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 13-May-2019, 11:41:14  
 Operator : WH  
 Sample : lcsd tcd 0.1ml  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: May 13 11:59:16 2019  
 Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 QLast Update : Tue Aug 29 16:13:13 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc    | Units |
|--------------------|--------|----------|---------|-------|
| -----              |        |          |         |       |
| Target Compounds   |        |          |         |       |
| 1) Oxygen/Argon    | 1.966f | 665150   | 0.140   | ppm   |
| 2) Carbon monoxide | 1.966f | 665150   | N.D.    | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.    | ppm   |
| 4) Carbon dioxide  | 6.066  | 217080   | 924.812 | ppm m |
| 6) Methane (FID)   | 0.000  | 0        | N.D.    | ppm   |
| 7) Ethylene        | 0.000  | 0        | N.D.    | ppm   |
| 8) Ethane          | 0.000  | 0        | N.D.    | ppm   |
| 9) Propylene       | 0.000  | 0        | N.D.    | ppm   |
| 10) Propane        | 0.000  | 0        | N.D.    | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.    | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.    | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.    | ppm   |
| -----              |        |          |         |       |

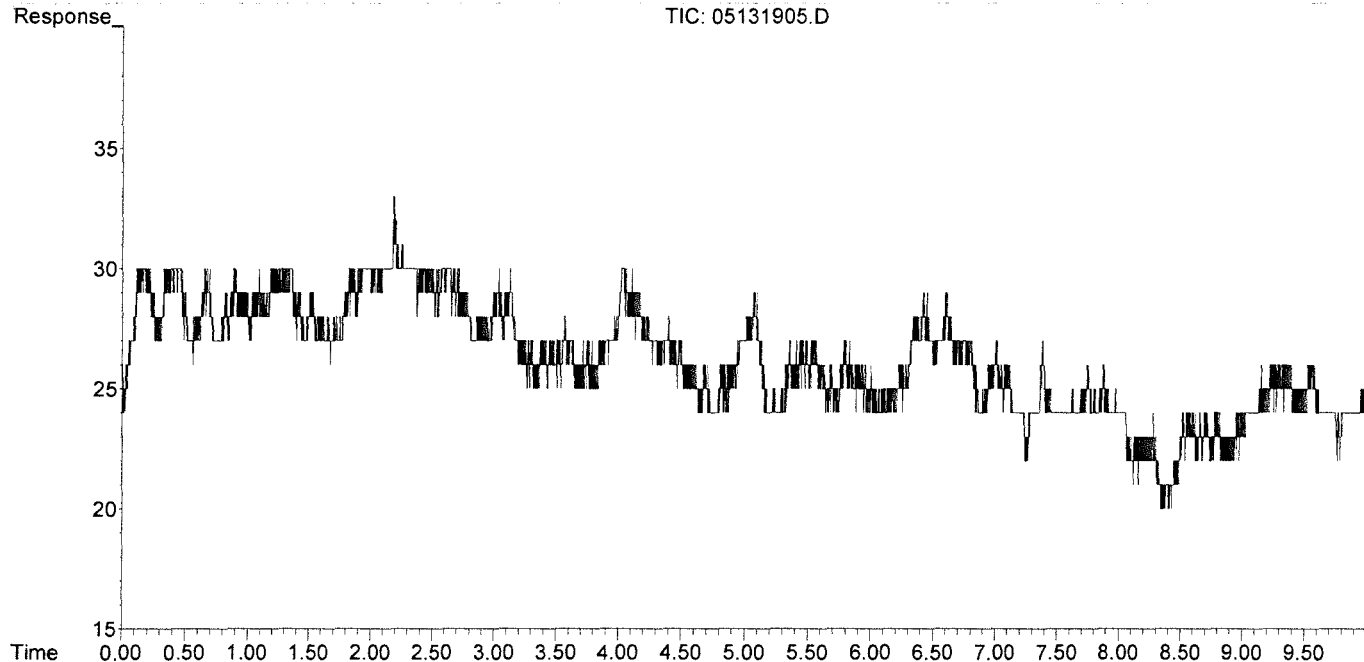
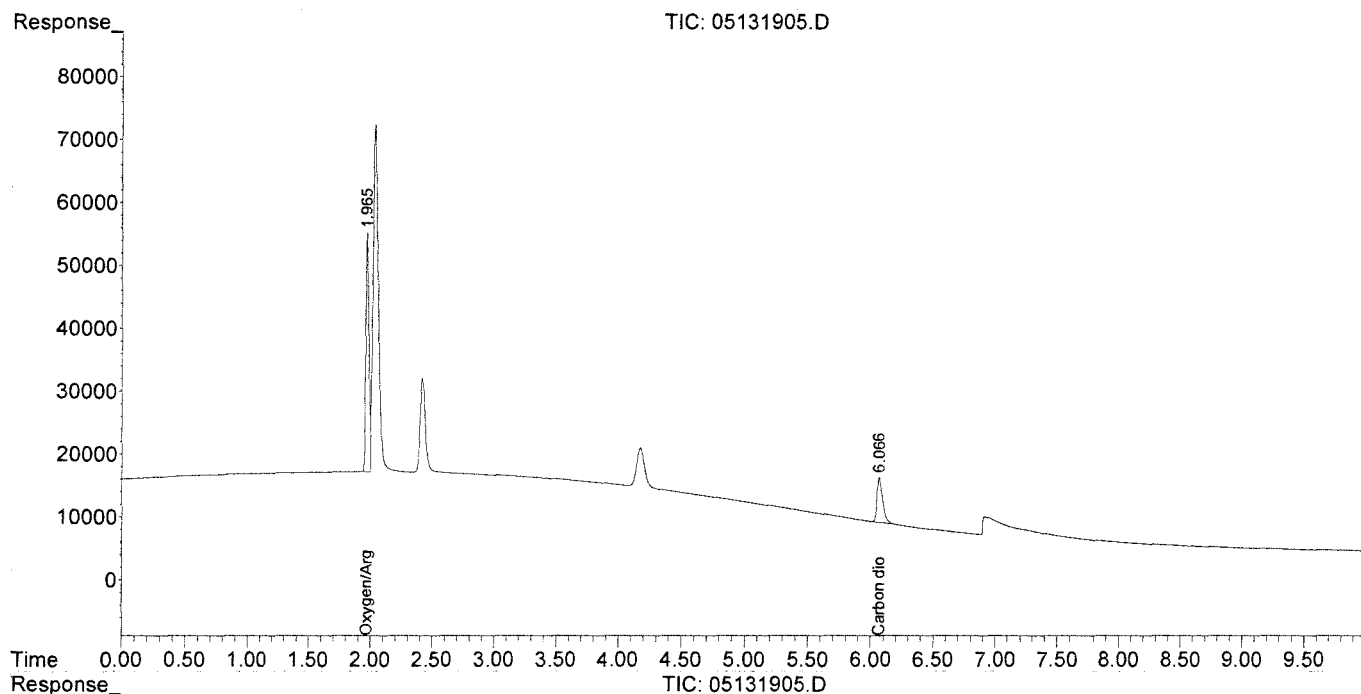
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131905.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:41:14  
Operator : WH  
Sample : lcsd tcd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 11:59:16 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

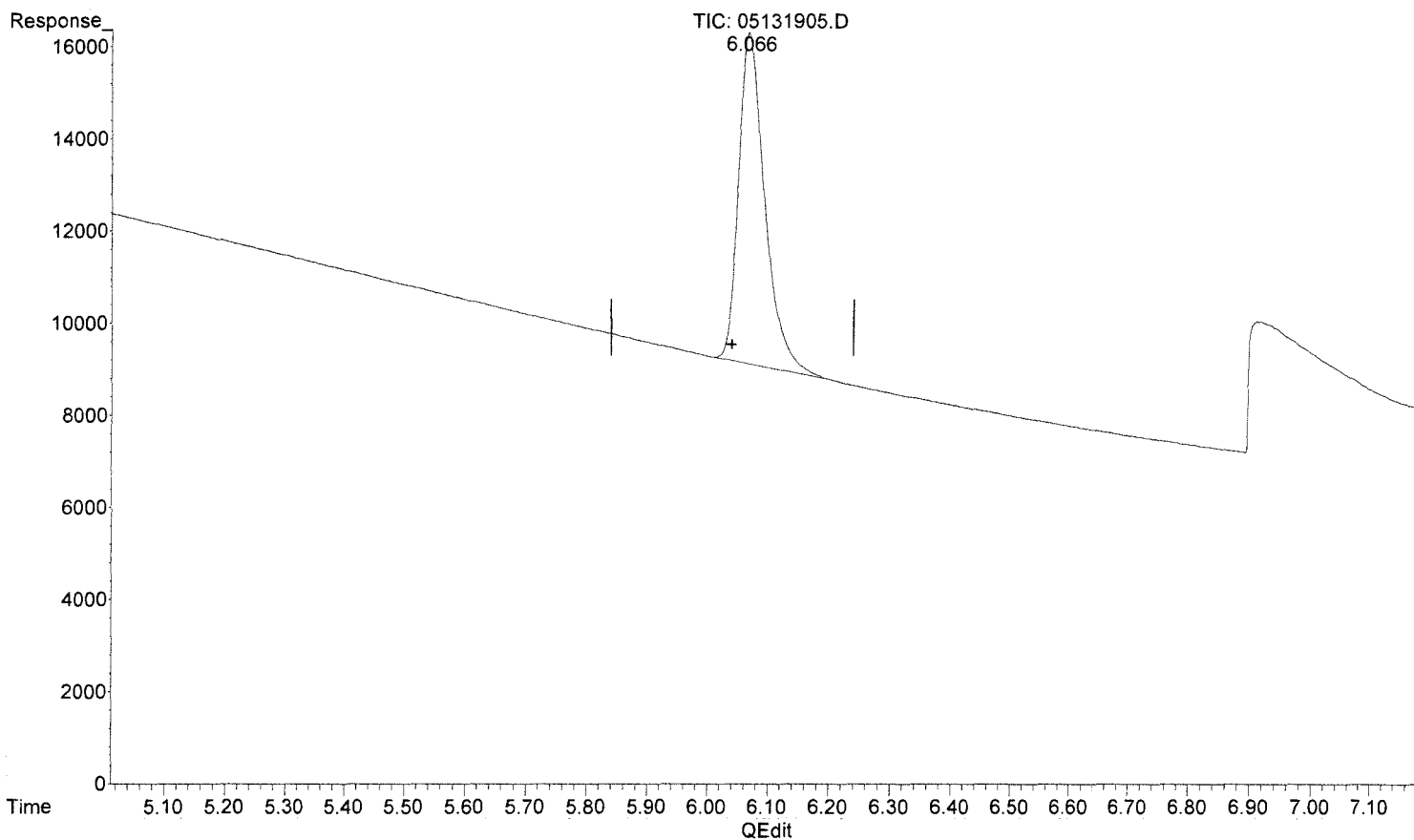




Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131905.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 11:41:14  
Operator : WH  
Sample : lcsd tcd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 11:59:16 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide  
6.066min 924.812 ppm m  
response 217080

MR  
5/14/19

6/5/19  
BLC  
m.p. 1000

Method Path : I:\GC10\METHODS\  
 Method File : RS082817\_CO2.M  
 Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 Last Update : Tue Aug 29 16:13:13 2017  
 Response Via : Initial Calibration

## Calibration Files

|   |             |   |             |   |             |
|---|-------------|---|-------------|---|-------------|
| 1 | =08291715.D | 2 | =08291716.D | 3 | =08291717.D |
| 4 | =08291719.D | 5 | =08291720.D | 6 | =08291721.D |

|    | Compound        | 1     | 2     | 3     | 4     | 5     | 6     | Avg      | %RSD   |
|----|-----------------|-------|-------|-------|-------|-------|-------|----------|--------|
| 1) | Oxygen/Argon    | 4.760 |       |       |       |       |       | 4.760 E6 | 0.00   |
| 2) | Carbon monoxide | 2.775 |       | 1.066 | 0.043 | 0.033 | 0.027 | 0.657 E6 | 170.12 |
| 3) | Methane (TCD)   |       |       |       |       |       |       | 9.457    | 0.00   |
| 4) | Carbon dioxide  | 2.717 | 2.193 | 2.338 | 2.272 | 2.265 | 2.298 | 2.347 E2 | 7.99   |

## Signal #2 Calibration Files

|   |             |   |             |   |             |
|---|-------------|---|-------------|---|-------------|
| 1 | =08291715.D | 2 | =08291716.D | 3 | =08291717.D |
| 4 | =08291719.D | 5 | =08291720.D | 6 | =08291721.D |

|     | Compound      | 1     | 2     | 3     | 4     | 5     | 6     | Avg      | %RSD  |
|-----|---------------|-------|-------|-------|-------|-------|-------|----------|-------|
| 6)  | Methane (FID) | 1.253 | 1.160 | 1.005 | 0.927 | 0.848 | 0.848 | 0.945 E4 | 15.85 |
| 7)  | Ethylene      | 1.677 | 1.605 | 1.900 | 1.749 | 1.597 | 1.579 | 1.684 E4 | 7.30  |
| 8)  | Ethane        | 1.769 | 1.631 | 1.866 | 1.767 | 1.639 | 1.667 | 1.723 E4 | 5.40  |
| 9)  | Propylene     | 2.402 | 2.309 | 2.767 | 2.551 | 2.331 | 2.333 | 2.449 E4 | 7.32  |
| 10) | Propane       | 2.906 | 2.737 | 2.817 | 2.639 | 2.410 | 2.420 | 2.655 E4 | 7.75  |
| 11) | Isobutylene   |       |       |       |       |       |       | 0.000    | -1.00 |
| 12) | Isobutane     |       |       |       |       |       |       | 0.000    | -1.00 |
| 13) | n-Butane      |       |       |       |       |       |       | 0.000    | -1.00 |

(#) = Out of Range ### Number of calibration levels exceeded format ###

RS082817\_CO2.M Wed Aug 30 13:24:19 2017

dit Compounds -- Compound #4 -- Carbon dioxide

Find Compound

Index

Name

Search by: Ret Time

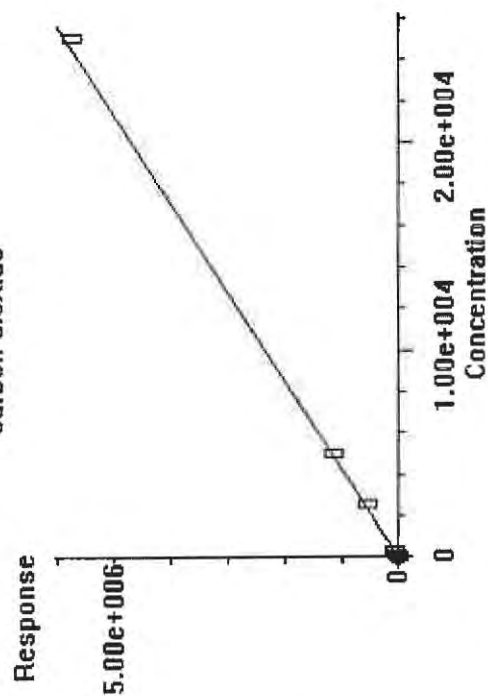
Identification Calibration User-Defined Advanced Reporting

Compound Database  
External Standard Compound

☒ Oxygen/Argon  
☒ Carbon monoxide  
☒ Methane (TCD)  
☒ **Carbon dioxide**  
☒ Signal #2  
☒ Methane (FID)  
☒ Ethylene  
☒ Ethane  
☒ Propylene  
☒ Propane  
☒ Isobutylene  
☒ Isobutane  
☒ n-Butane

| Lvl ID | Concentration | Response       | Lvl ID | Concentration | Response |
|--------|---------------|----------------|--------|---------------|----------|
| 1      | 25.000000     | 6793.665186    |        |               |          |
| 2      | 100.000000    | 21932.418000   |        |               |          |
| 3      | 250.000000    | 58460.642510   |        |               |          |
| 4      | 2500.000000   | 568043.388750  |        |               |          |
| 5      | 5000.000000   | 1132363.215937 |        |               |          |
| 6      | 25000.000000  | 5744294.891563 |        |               |          |
| 7      | 25000.000000  |                |        |               |          |
| 8      | 25000.000000  |                |        |               |          |
| 9      | 2000.000000   |                |        |               |          |
| 10     | 30000.000000  |                |        |               |          |

Carbon dioxide



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 2.347e+002 | Linear term    |
| 0.000e+000 | Constant term  |
| 7.987%     | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve

Method Path : I:\GC10\METHODS\  
 Method File : RS082817\_CO2.M  
 Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 Last Update : Tue Aug 29 16:13:13 2017  
 Response Via : Initial Calibration

| #  | ID | Conc  | ISTD<br>Conc | Path\File                                  |
|----|----|-------|--------------|--|
| 1  | 1  | 0     | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291715.D |
| 2  | 2  | 0     | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291716.D |
| 3  | 3  | 3     | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291717.D |
| 4  | 4  | 10    | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291719.D |
| 5  | 5  | 25    | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291720.D |
| 6  | 6  | 125   | 0            | J:\GC10\DATA\RSK_FID\2017_08\29\08291721.D |
| 7  | 7  | 5000  | 0            | J:\GC10\DATA\RSK_FID\2017_08\24\08241708.D |
| 8  | 8  | 25000 | 0            | J:\GC10\DATA\RSK_FID\2017_08\24\08241709.D |
| 9  | 9  | 2000  | 0            | J:\GC10\DATA\RSK_FID\2017_08\24\08241710.D |
| 10 | 10 | 30000 | 0            | J:\GC10\DATA\RSK_FID\2017_08\24\08241711.D |

| #  | ID | Update Time       | Quant Time        | Acquisition Time   |
|----|----|-------------------|-------------------|--------------------|
| 1  | 1  | Aug 29 14:21 2017 | Aug 29 14:20 2017 | 29-Aug-2017, 14:07 |
| 2  | 2  | Aug 29 14:52 2017 | Aug 29 14:51 2017 | 29-Aug-2017, 14:22 |
| 3  | 3  | Aug 29 15:04 2017 | Aug 29 15:04 2017 | 29-Aug-2017, 14:53 |
| 4  | 4  | Aug 29 15:36 2017 | Aug 29 15:36 2017 | 29-Aug-2017, 15:23 |
| 5  | 5  | Aug 29 15:57 2017 | Aug 29 15:57 2017 | 29-Aug-2017, 15:44 |
| 6  | 6  | Aug 29 16:13 2017 | Aug 29 16:13 2017 | 29-Aug-2017, 16:00 |
| 7  | 7  | Aug 25 09:05 2017 | Aug 24 16:00 2017 | 24-Aug-2017, 15:44 |
| 8  | 8  | Aug 25 09:06 2017 | Aug 24 16:13 2017 | 24-Aug-2017, 16:02 |
| 9  | 9  | Aug 25 09:06 2017 | Aug 24 16:31 2017 | 24-Aug-2017, 16:16 |
| 10 | 10 | Aug 25 09:07 2017 | Aug 24 16:42 2017 | 24-Aug-2017, 16:33 |

RS082817\_CO2.M Wed Aug 30 13:24:30 2017

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291715.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:07  
Operator : MC  
Sample : 25ppm s32-08291701 0.25ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 14:20:06 2017  
Quant Method : I:\GC10\METHODS\RS082417.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Fri Aug 25 09:19:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc   | Units |
|--------------------|-------|----------|--------|-------|
| -----              |       |          |        |       |
| Target Compounds   |       |          |        |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.   | ppm d |
| 2) Carbon monoxide | 1.776 | 277465   | N.D.   | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.   | ppm   |
| 4) Carbon dioxide  | 5.978 | 6794     | 27.870 | ppm m |
| 6) Methane (FID)   | 0.000 | 0        | N.D.   | ppm d |
| 7) Ethylene        | 0.000 | 0        | N.D.   | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.   | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.   | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.   | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.   | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.   | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.   | ppm   |
| -----              |       |          |        |       |

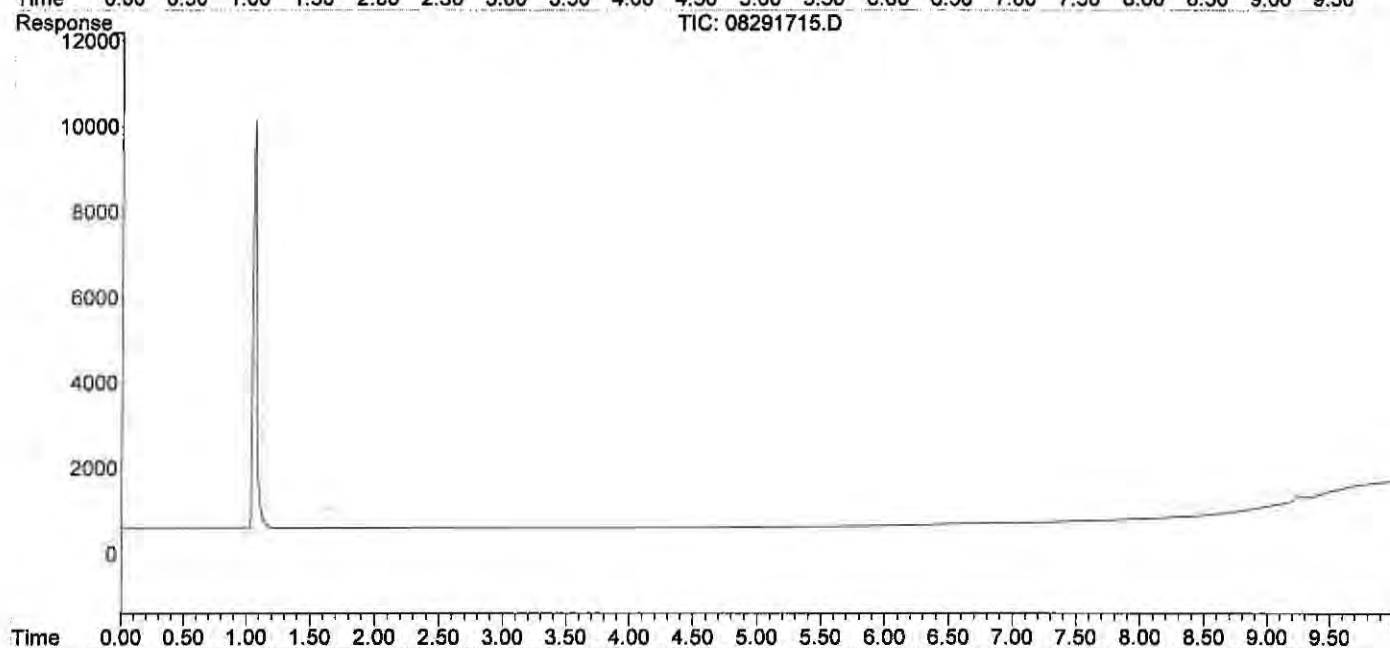
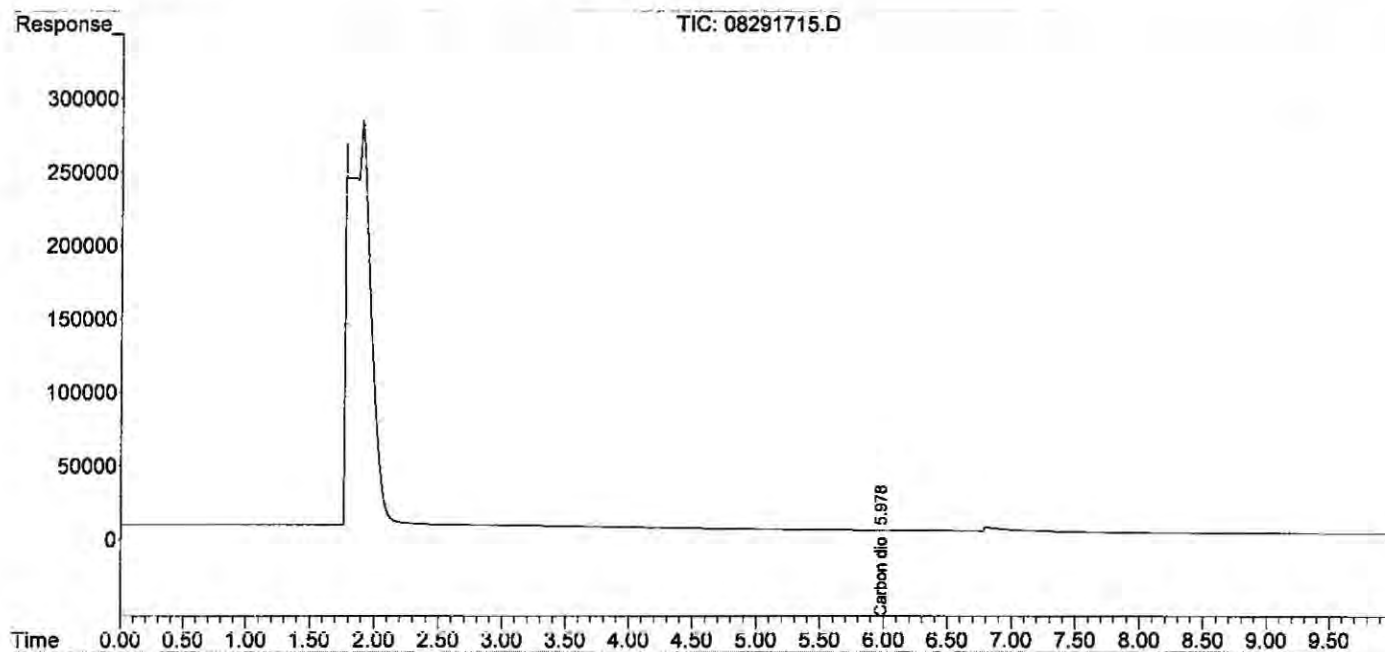
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291715.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:07  
Operator : MC  
Sample : 25ppm s32-08291701 0.25ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 14:20:06 2017  
Quant Method : I:\GC10\METHODS\RS082417.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Fri Aug 25 09:19:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

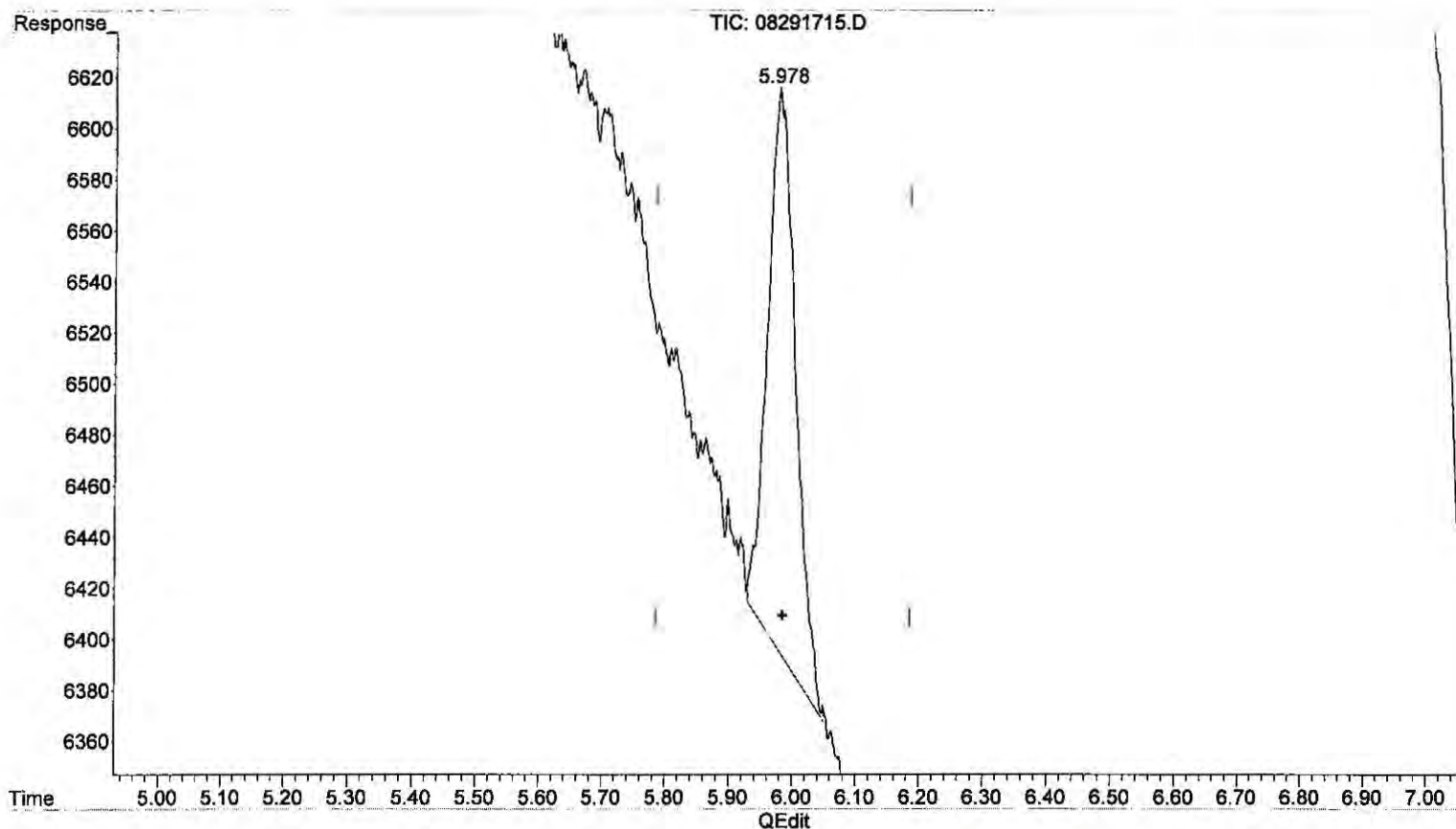
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291715.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:07  
Operator : MC  
Sample : 25ppm s32-08291701 0.25ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 14:20:06 2017  
Quant Method : I:\GC10\METHODS\RS082417.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Fri Aug 25 09:19:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide

5.978min 27.870 ppm m

response 6794

MC  
8/30/17  
BL  
M  
ppm

MC  
8/14/17



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291716.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:22  
Operator : MC  
Sample : 100ppm s32-08291702 0.2ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 14:51:38 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 14:21:08 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc   | Units |
|--------------------|-------|----------|--------|-------|
| -----              |       |          |        |       |
| Target Compounds   |       |          |        |       |
| 1) Oxygen/Argon    | 1.790 | -598962  | N.D.   | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.   | ppm d |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.   | ppm   |
| 4) Carbon dioxide  | 5.978 | 21932    | 87.858 | ppm   |
| 6) Methane (FID)   | 0.000 | 0        | N.D.   | ppm d |
| 7) Ethylene        | 0.000 | 0        | N.D.   | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.   | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.   | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.   | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.   | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.   | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.   | ppm   |
| -----              |       |          |        |       |

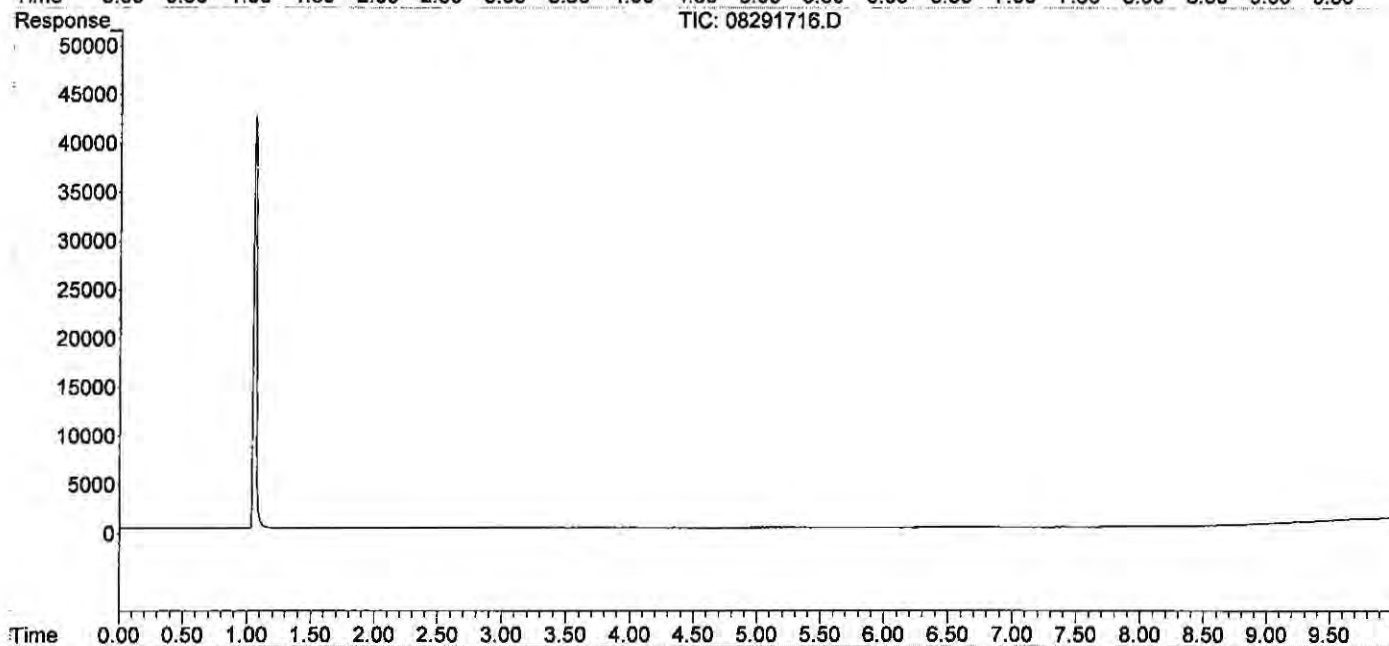
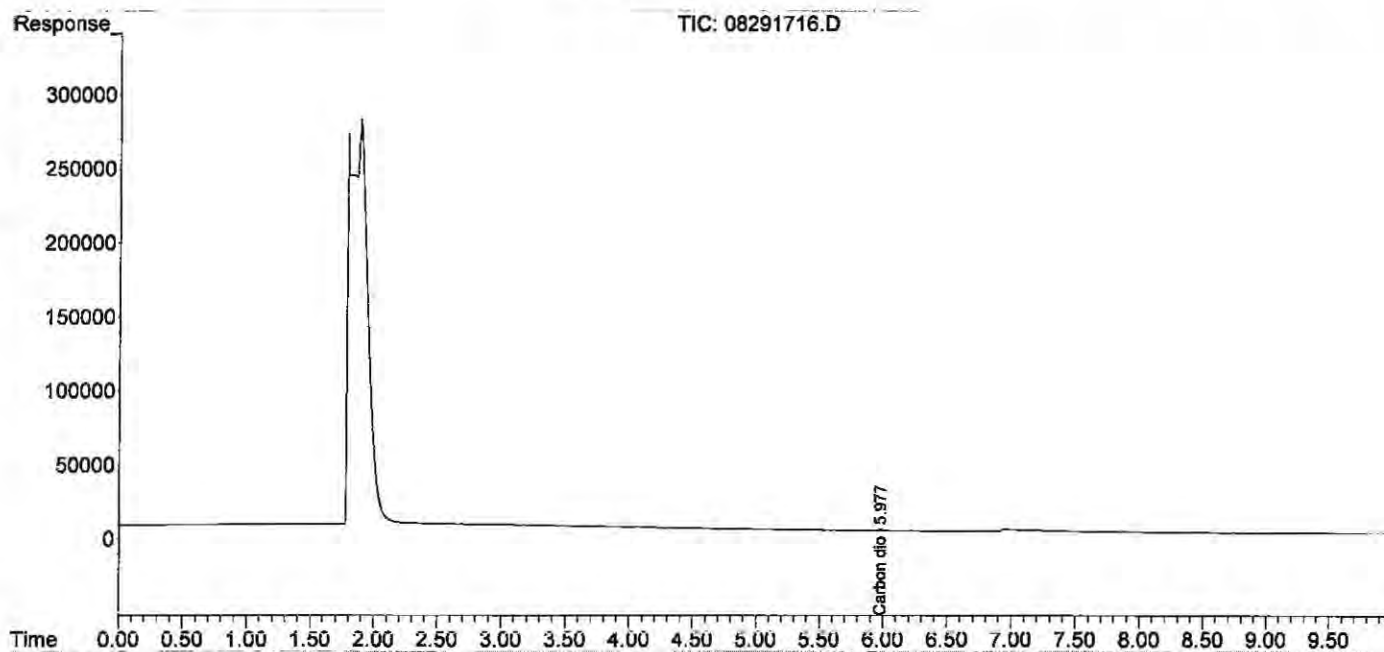
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291716.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:22  
Operator : MC  
Sample : 100ppm s32-08291702 0.2ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 14:51:38 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 14:21:08 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291717.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:53  
Operator : MC  
Sample : 250ppm s32-08291702 0.5ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:03:42 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 14:52:06 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response  | Conc    | Units |
|--------------------|--------|-----------|---------|-------|
| -----              |        |           |         |       |
| Target Compounds   |        |           |         |       |
| 1) Oxygen/Argon    | 1.920f | -30716454 | N.D.    | ppm   |
| 2) Carbon monoxide | 0.000  | 0         | N.D.    | ppm d |
| 3) Methane (TCD)   | 0.000  | 0         | N.D.    | ppm d |
| 4) Carbon dioxide  | 5.970  | 58461     | 240.204 | ppm m |
| 6) Methane (FID)   | 0.000  | 0         | N.D.    | ppm d |
| 7) Ethylene        | 0.000  | 0         | N.D.    | ppm   |
| 8) Ethane          | 0.000  | 0         | N.D.    | ppm   |
| 9) Propylene       | 0.000  | 0         | N.D.    | ppm   |
| 10) Propane        | 0.000  | 0         | N.D.    | ppm   |
| 11) Isobutylene    | 0.000  | 0         | N.D.    | ppm   |
| 12) Isobutane      | 0.000  | 0         | N.D.    | ppm   |
| 13) n-Butane       | 0.000  | 0         | N.D.    | ppm   |
| -----              |        |           |         |       |

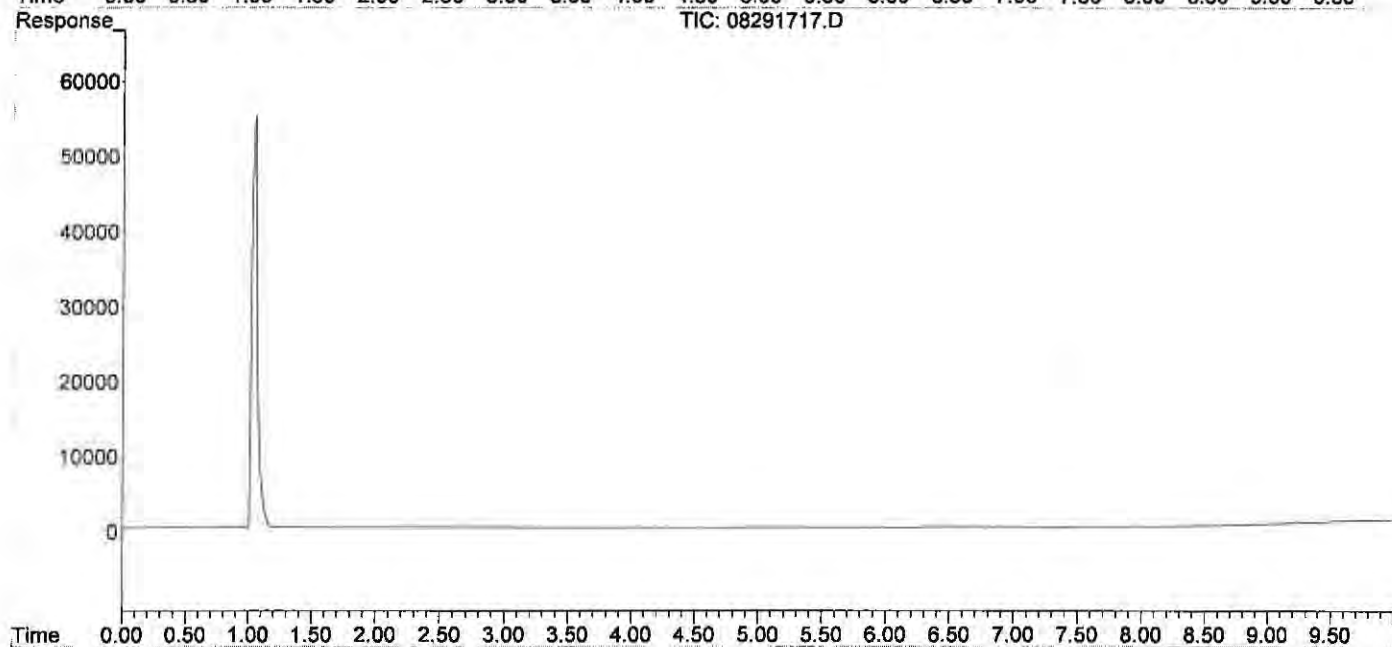
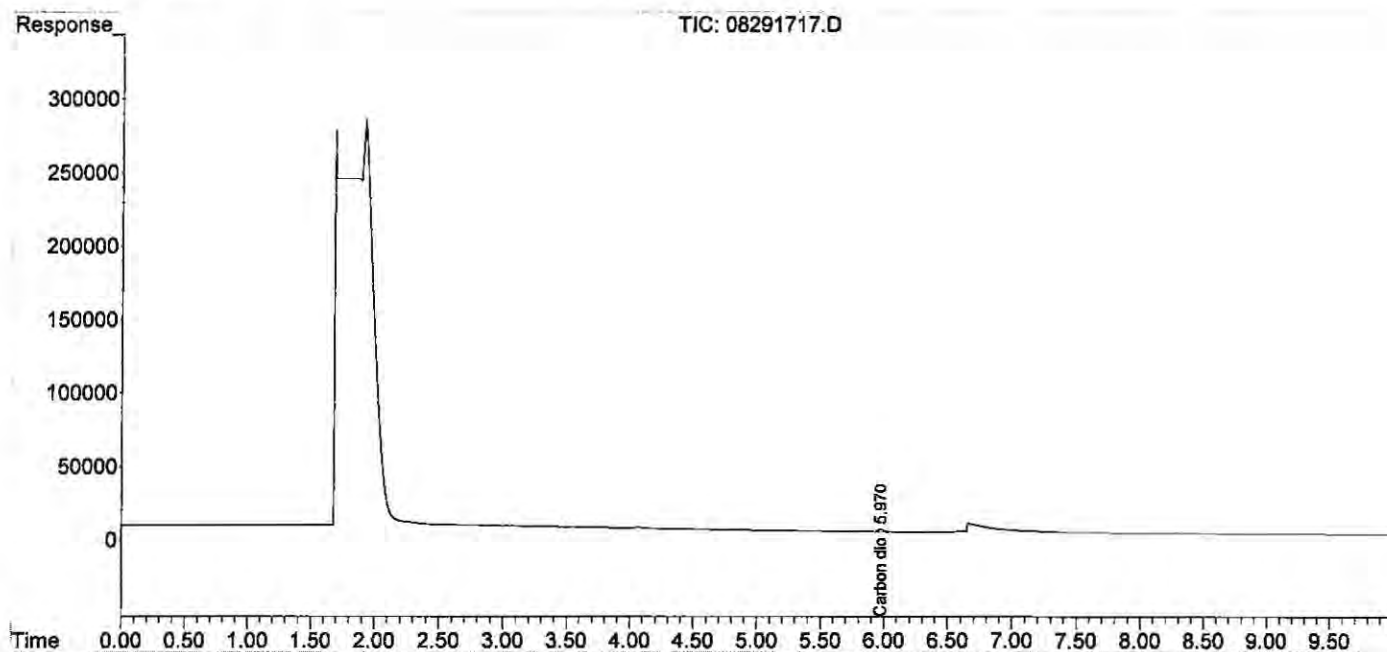
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291717.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:53  
Operator : MC  
Sample : 250ppm s32-08291702 0.5ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:03:42 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 14:52:06 2017  
Response via : Initial Calibration  
Integrator: ChemStation

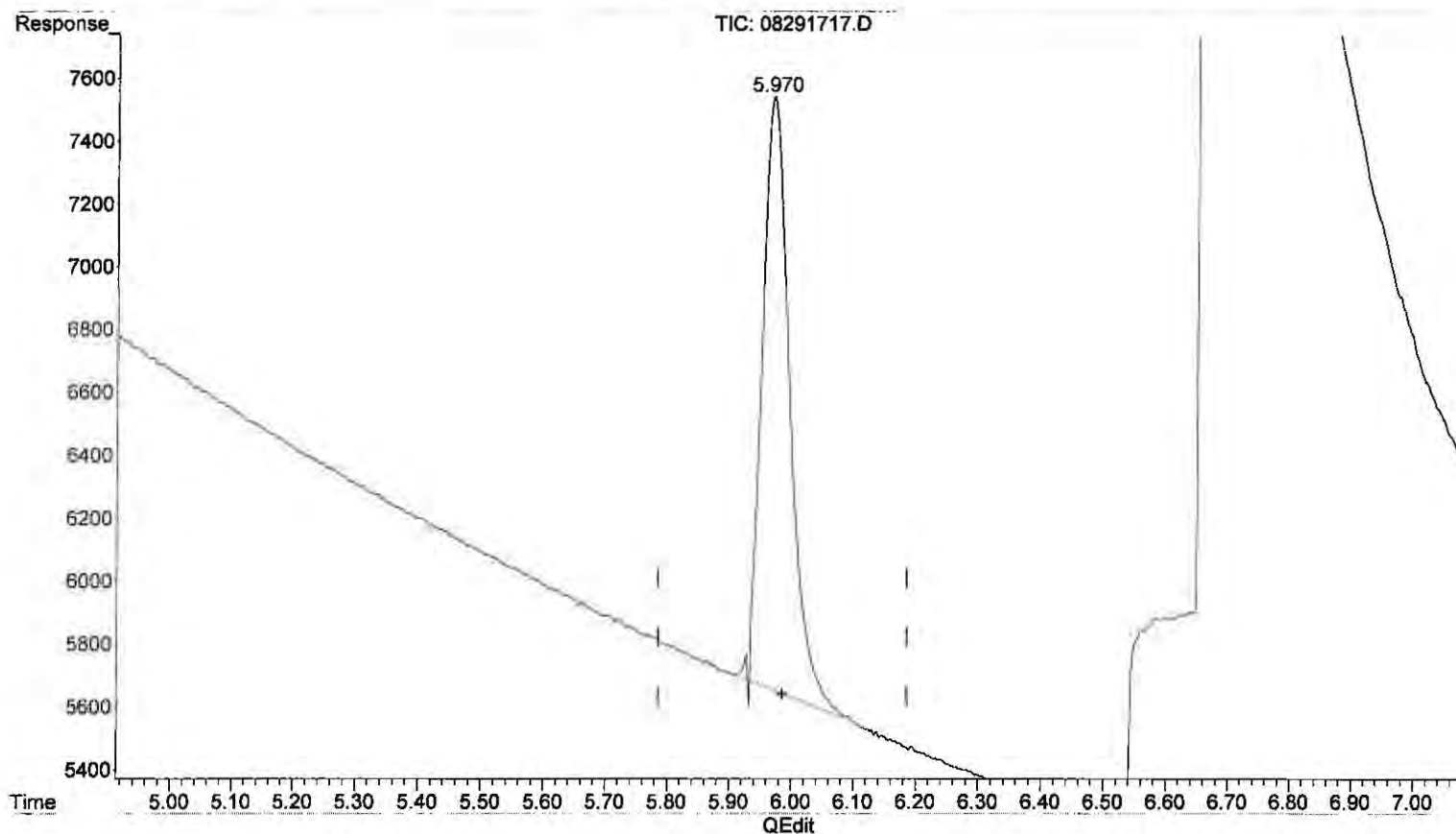
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291717.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 14:53  
Operator : MC  
Sample : 250ppm s32-08291702 0.5ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:03:42 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 14:52:06 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide

5.970min 240.204 ppm m

response 58461

*MC*  
*8/1/17*  
*pu*  
*N,*  
*prw*

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291719.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 15:23  
Operator : MC  
Sample : 2500ppm s32-08231701 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:35:50 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 15:04:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc     | Units |
|--------------------|-------|----------|----------|-------|
| -----              |       |          |          |       |
| Target Compounds   |       |          |          |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.     | ppm d |
| 2) Carbon monoxide | 1.891 | 425113   | N.D.     | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.     | ppm d |
| 4) Carbon dioxide  | 5.962 | 568043   | 2369.673 | ppm   |
| 6) Methane (FID)   | 0.000 | 0        | N.D.     | ppm d |
| 7) Ethylene        | 0.000 | 0        | N.D.     | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.     | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.     | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.     | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.     | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.     | ppm   |
| -----              |       |          |          |       |

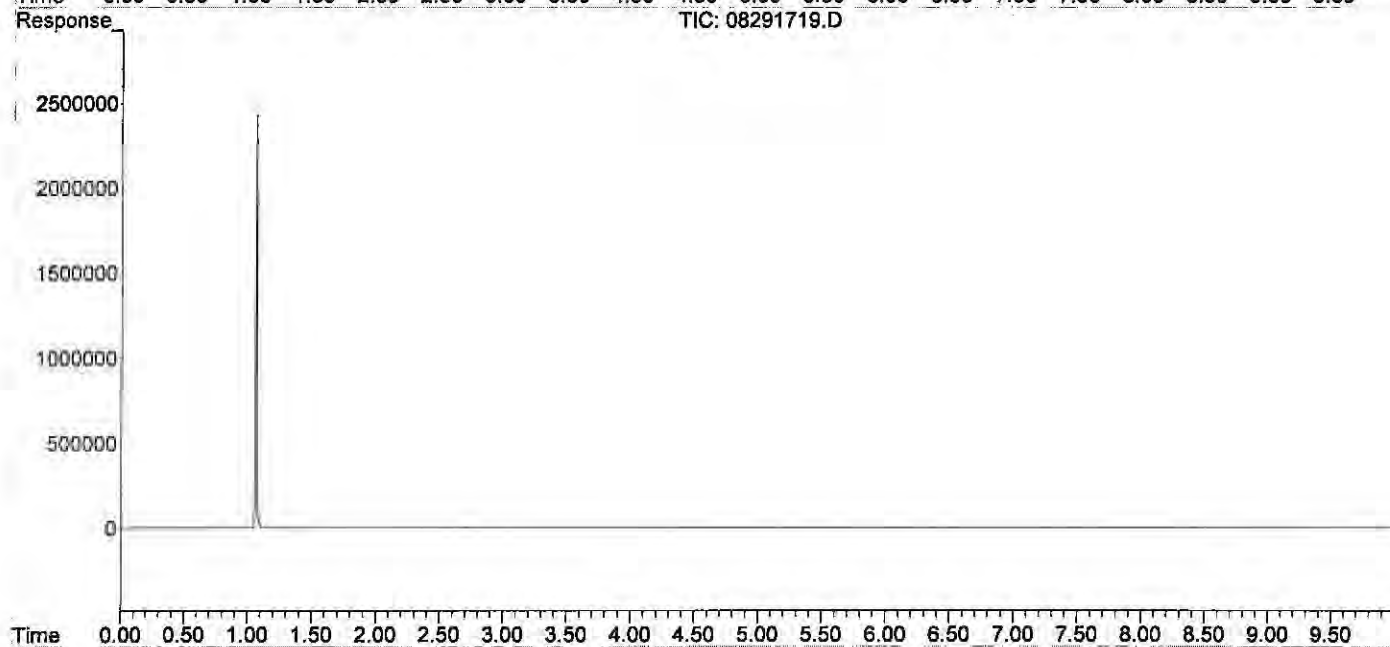
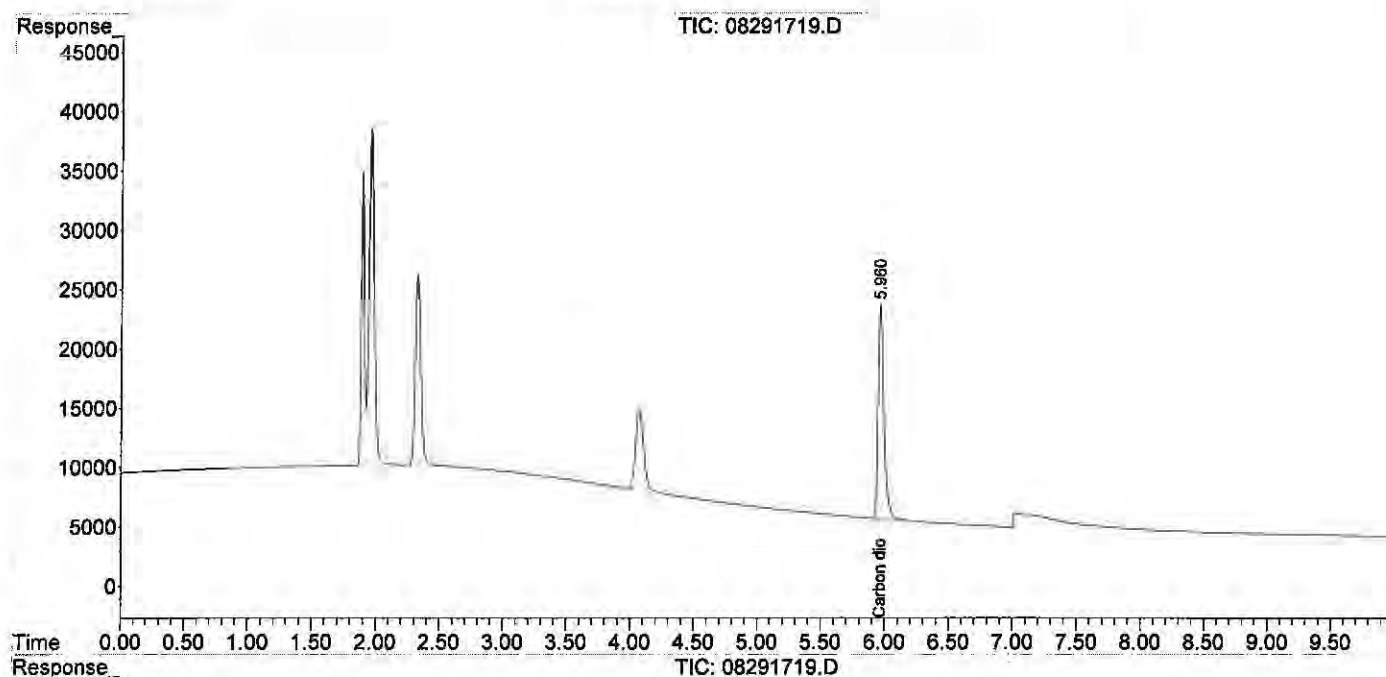
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291719.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 15:23  
Operator : MC  
Sample : 2500ppm s32-08231701 50ul  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:35:50 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 15:04:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291720.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 15:44  
Operator : MC  
Sample : 5000ppm s32-08231701 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:57:17 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 15:36:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc     | Units |
|--------------------|-------|----------|----------|-------|
| Target Compounds   |       |          |          |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.     | ppm d |
| 2) Carbon monoxide | 1.880 | 819221   | N.D.     | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.     | ppm d |
| 4) Carbon dioxide  | 5.948 | 1132363  | 4753.126 | ppm   |
| 6) Methane (FID)   | 0.000 | 0        | N.D.     | ppm d |
| 7) Ethylene        | 0.000 | 0        | N.D.     | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.     | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.     | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.     | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.     | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.     | ppm   |

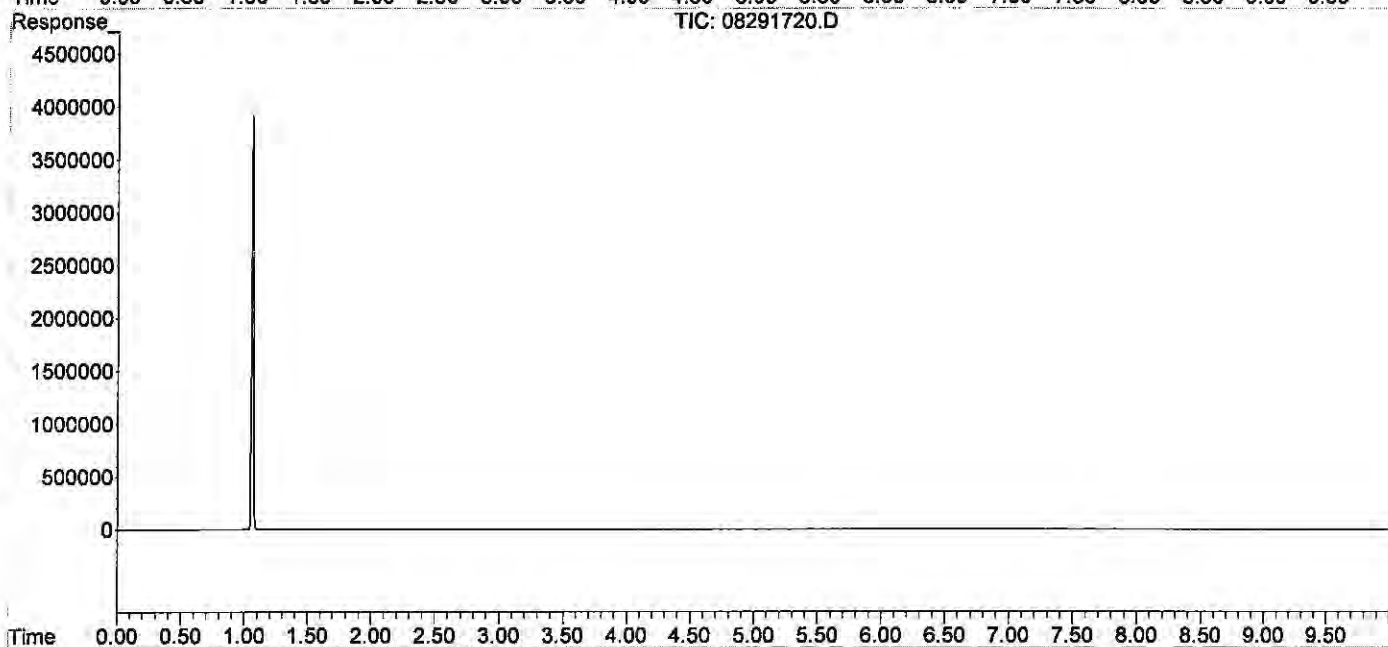
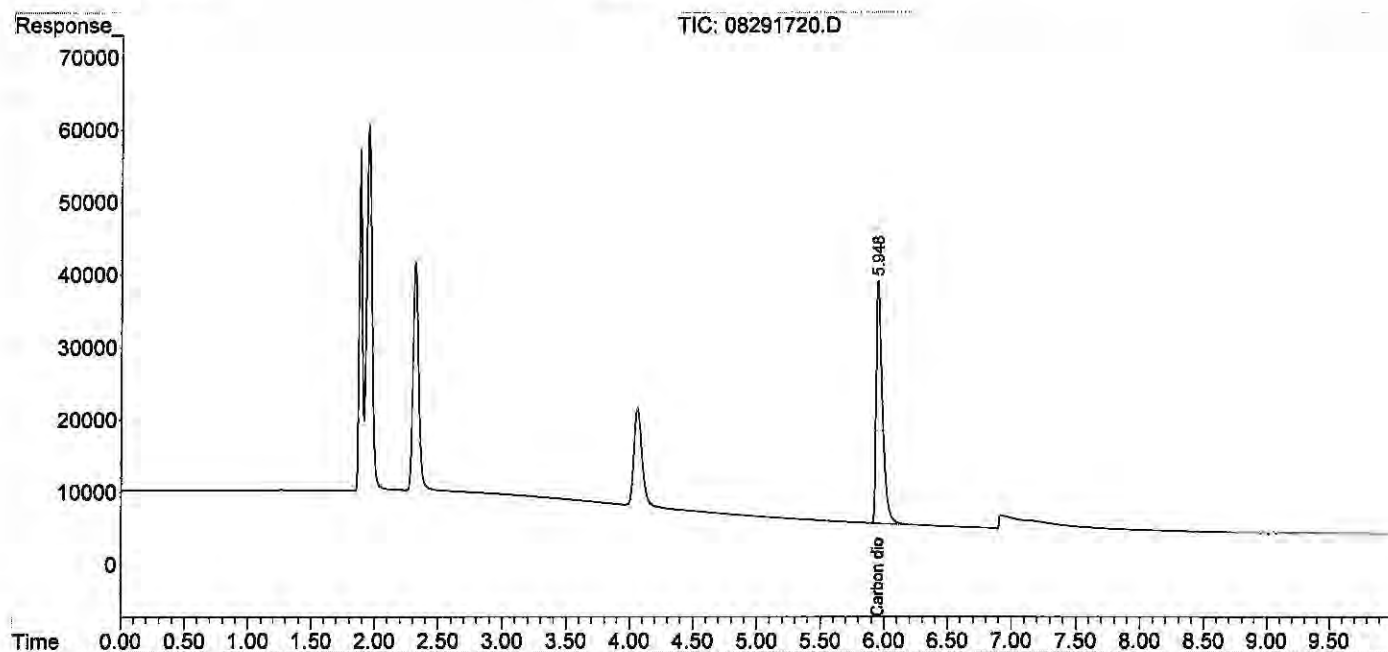
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291720.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 15:44  
Operator : MC  
Sample : 5000ppm s32-08231701 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 15:57:17 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 15:36:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291721.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 16:00  
Operator : MC  
Sample : 25000ppm s32-08231701 0.5ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 16:12:53 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 15:57:37 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc      | Units |
|--------------------|--------|----------|-----------|-------|
| -----              |        |          |           |       |
| Target Compounds   |        |          |           |       |
| 1) Oxygen/Argon    | 0.000  | 0        | N.D.      | ppm d |
| 2) Carbon monoxide | 1.827  | 3325463  | N.D.      | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.      | ppm d |
| 4) Carbon dioxide  | 5.879f | 5744295  | 24443.288 | ppm   |
| 6) Methane (FID)   | 0.000  | 0        | N.D.      | ppm d |
| 7) Ethylene        | 0.000  | 0        | N.D.      | ppm   |
| 8) Ethane          | 0.000  | 0        | N.D.      | ppm   |
| 9) Propylene       | 0.000  | 0        | N.D.      | ppm   |
| 10) Propane        | 0.000  | 0        | N.D.      | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.      | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.      | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.      | ppm   |
| -----              |        |          |           |       |

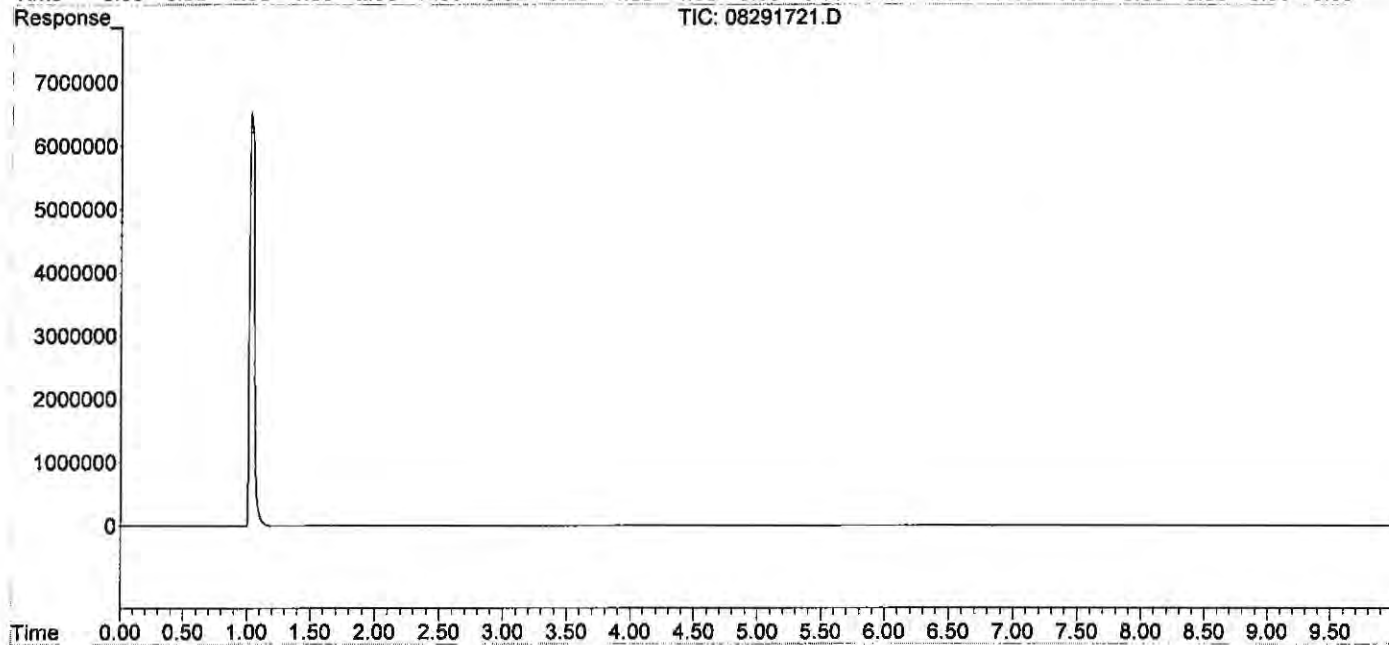
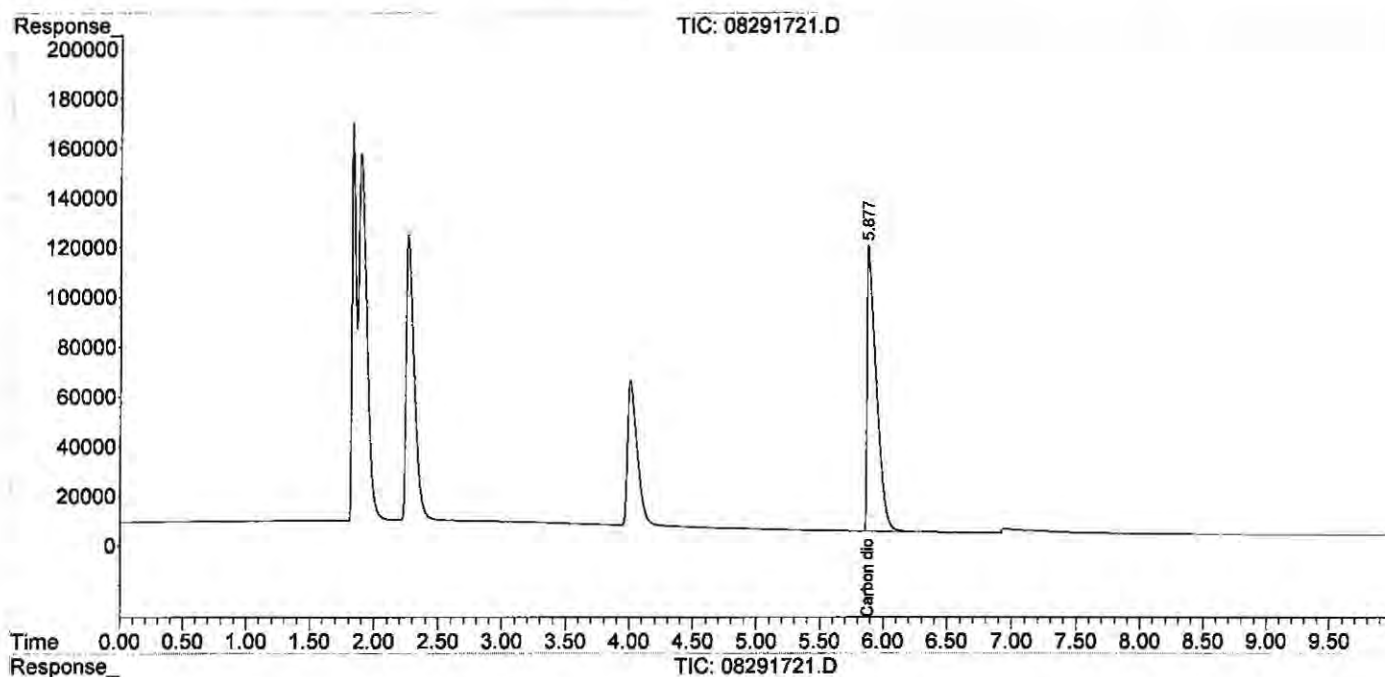
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291721.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 16:00  
Operator : MC  
Sample : 25000ppm s32-08231701 0.5ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 16:12:53 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Tue Aug 29 15:57:37 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
 Data File : 08291723.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 29-Aug-2017, 16:35  
 Operator : MC  
 Sample : icv s30-07071701  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Aug 29 16:54:07 2017  
 Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
 QLast Update : Tue Aug 29 16:13:13 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units    |            |
|--------------------|--------|----------|---------------|------------|
| -----              |        |          |               |            |
| Target Compounds   |        |          |               |            |
| 1) Oxygen/Argon    | 1.886  | 536422   | 0.113 ppm     | Actual %D  |
| 2) Carbon monoxide | 1.886  | 536422   | N.D. ppm      |            |
| 3) Methane (TCD)   | 4.059f | 626500   | 66244.710 ppm |            |
| 4) Carbon dioxide  | 5.947  | 1163775  | 4957.948 ppm  | 5000 99.16 |
| 6) Methane (FID)   | 1.062  | 37290742 | 3947.023 ppm  |            |
| 7) Ethylene        | 0.000  | 0        | N.D. ppm      |            |
| 8) Ethane          | 0.000  | 0        | N.D. ppm      |            |
| 9) Propylene       | 0.000  | 0        | N.D. ppm      |            |
| 10) Propane        | 0.000  | 0        | N.D. ppm      |            |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm      |            |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm      |            |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm      |            |
| -----              |        |          |               |            |

(f)=RT Delta > 1/2 Window

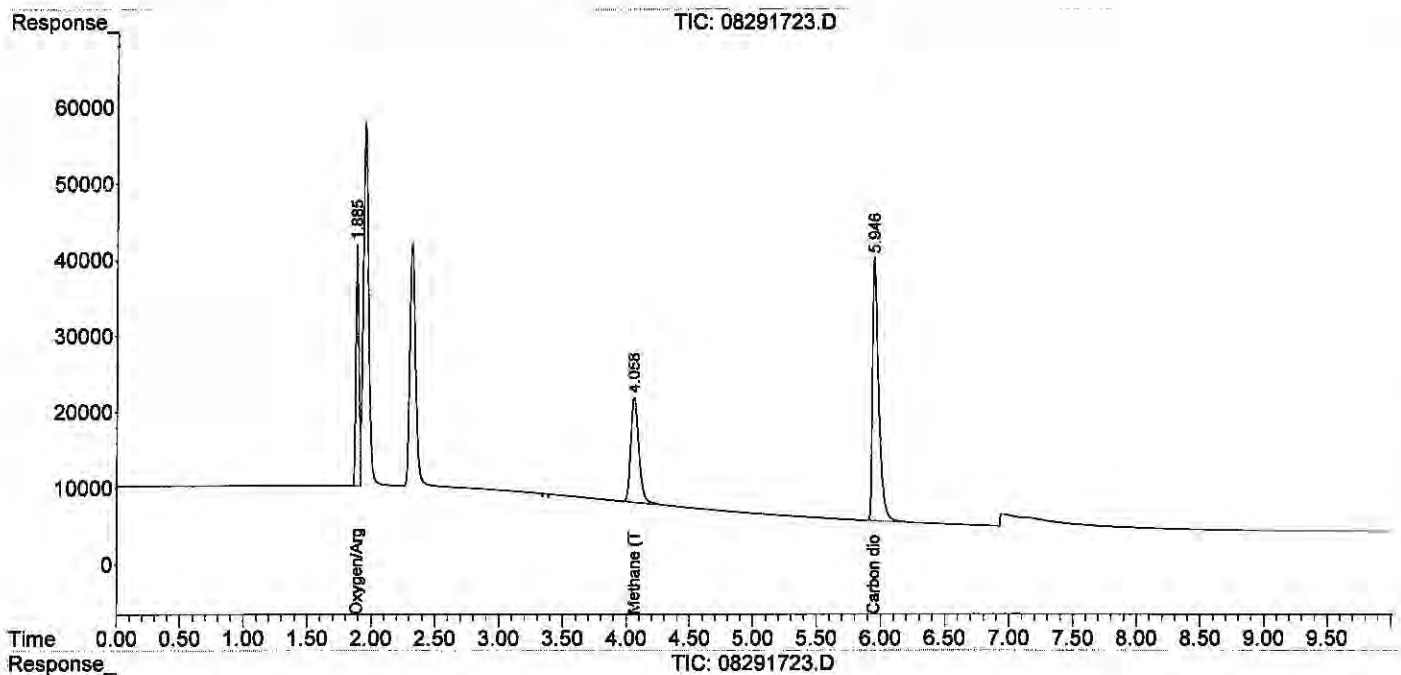
(m)=manual int.

W 9/4/17

Data Path : J:\GC10\DATA\RSK\_FID\2017\_08\29\  
Data File : 08291723.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 29-Aug-2017, 16:35  
Operator : MC  
Sample : icv s30-07071701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Aug 29 16:54:07 2017  
Quant Method : I:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



ALS Environmental

Method : RSK175 Headspace Method for Dissolved Hydrocarbon in Water by FID/TCD  
Client : ALS Laboratory Group  
Service Request: P1902518  
Sample Vol. (ml) : 32.00 ml

Analyst : WH  
Date Analysis : 05/13/19  
Head Space Vol.(ml) : 8.00 ml

Instrument : GC#10  
Detector : FID#10, TCD#10  
Gas Constant : 24.05684 (20°C)

HEAD SPACE RESULT (ppm)

| Sample ID         | Ini_Vol | Carbon Dioxide | Henry's Constant  | Wwt | Carbon Dioxide |
|-------------------|---------|----------------|-------------------|-----|----------------|
| std s32-04251903  | 0.100   | 4880.961       |                   |     | 44.10          |
| ACTUAL            |         | 5000.00        |                   |     | 1.42E+03       |
| %Difference       |         | 2.4%           |                   |     | 100.00         |
| mcs 0.1ml         | 0.100   | 0.000          | mcs 0.1ml         |     | 0.000          |
| rb 0.1ml          | 0.100   | 0.000          |                   |     |                |
| ics tcd 0.1ml     | 0.100   | 882.856        | ics tcd 0.1ml     |     | 8828.560       |
| icsd tcd 0.1ml    | 0.100   | 924.812        | icsd tcd 0.1ml    |     | 9248.120       |
| P1902518-001 50ul | 0.050   | 19195.37       | P1902518-001 50ul |     | 383907.30      |
| P1902518-002 50ul | 0.050   | 19720.18       | P1902518-002 50ul |     | 394403.68      |
| P1902518-003 50ul | 0.050   | 6255.744       | P1902518-003 50ul |     | 125114.88      |

std s32-04251903

ACTUAL

%Difference

4596.279

5000.00

8.1%



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131901.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 10:39:51  
Operator : WH  
Sample : std s32-04251903  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 10:52:50 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc     | Units |
|--------------------|--------|----------|----------|-------|
| -----              |        |          |          |       |
| Target Compounds   |        |          |          |       |
| 1) Oxygen/Argon    | 1.965f | 585039   | 0.123    | ppm   |
| 2) Carbon monoxide | 1.965f | 585039   | N.D.     | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.     | ppm   |
| 4) Carbon dioxide  | 6.042  | 1145704  | 4880.961 | ppm m |
| 6) Methane (FID)   | 0.000  | 0        | N.D.     | ppm   |
| 7) Ethylene        | 0.000  | 0        | N.D.     | ppm   |
| 8) Ethane          | 0.000  | 0        | N.D.     | ppm   |
| 9) Propylene       | 0.000  | 0        | N.D.     | ppm   |
| 10) Propane        | 0.000  | 0        | N.D.     | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.     | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.     | ppm   |
| -----              |        |          |          |       |

(f)=RT Delta > 1/2 Window

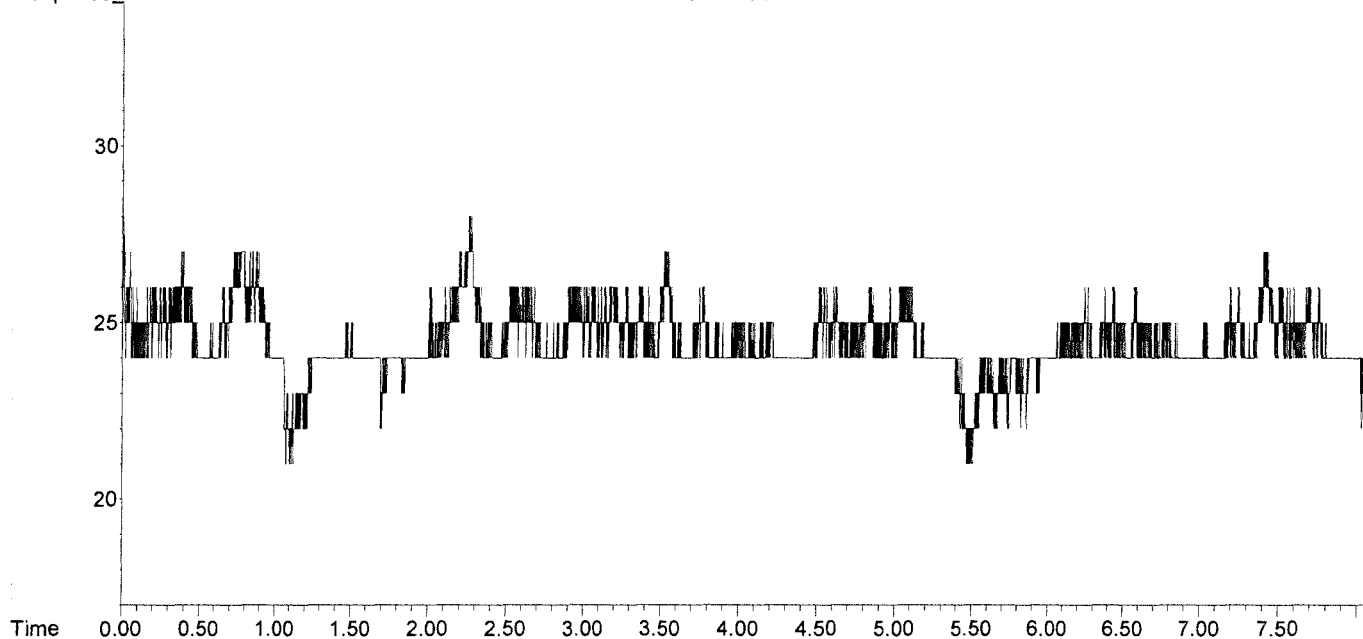
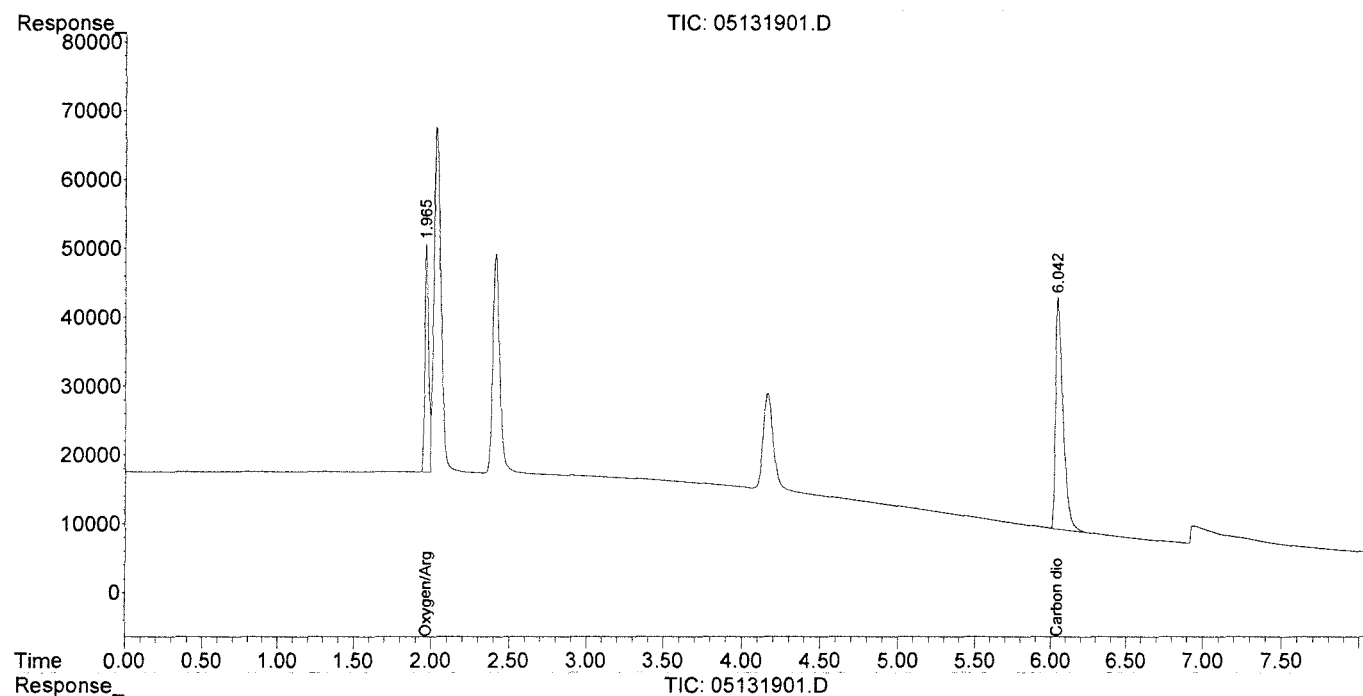
(m)=manual int.

W 1/14/19

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131901.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 10:39:51  
Operator : WH  
Sample : std s32-04251903  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 10:52:50 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

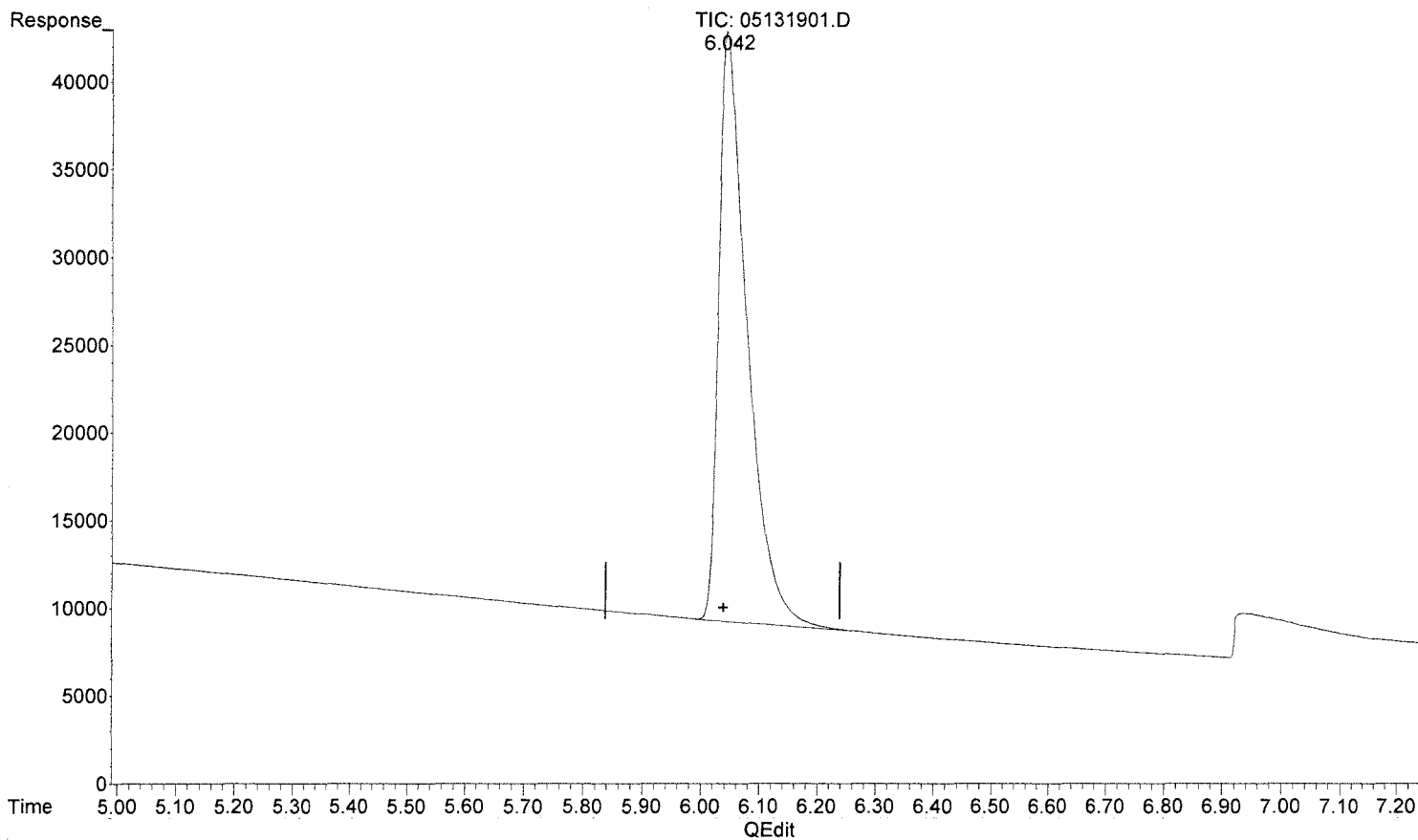
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131901.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 10:39:51  
Operator : WH  
Sample : std s32-04251903  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 10:52:50 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(4) Carbon dioxide  
6.042min 4880.961 ppm m  
response 1145704

MR  
5/14/19

Low flux  
BLC  
n' previous

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131915.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 14:32:20  
Operator : WH  
Sample : std s32-04251903  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 14:41:16 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units   |
|--------------------|--------|----------|--------------|
| -----              |        |          |              |
| Target Compounds   |        |          |              |
| 1) Oxygen/Argon    | 1.967f | 853084   | 0.179 ppm    |
| 2) Carbon monoxide | 1.967f | 853084   | N.D. ppm     |
| 3) Methane (TCD)   | 0.000  | 0        | N.D. ppm     |
| 4) Carbon dioxide  | 6.044  | 1078881  | 4596.279 ppm |
| 6) Methane (FID)   | 0.000  | 0        | N.D. ppm     |
| 7) Ethylene        | 0.000  | 0        | N.D. ppm     |
| 8) Ethane          | 0.000  | 0        | N.D. ppm     |
| 9) Propylene       | 0.000  | 0        | N.D. ppm     |
| 10) Propane        | 0.000  | 0        | N.D. ppm     |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm     |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm     |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm     |
| -----              |        |          |              |

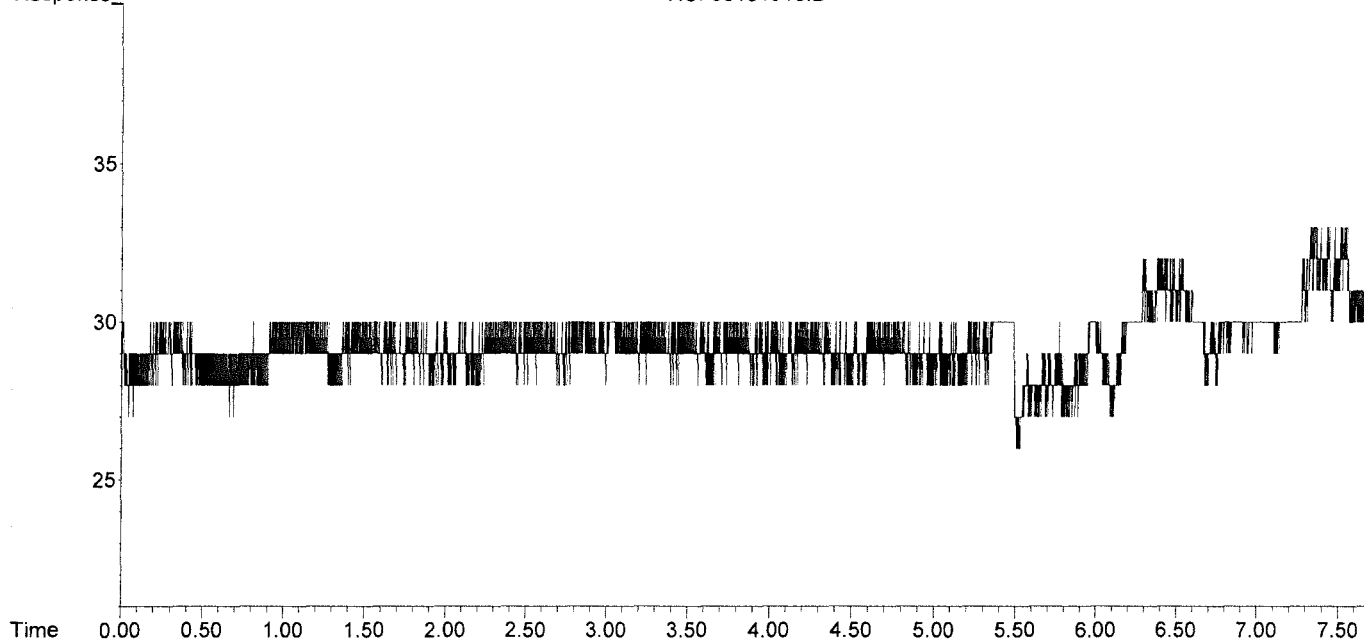
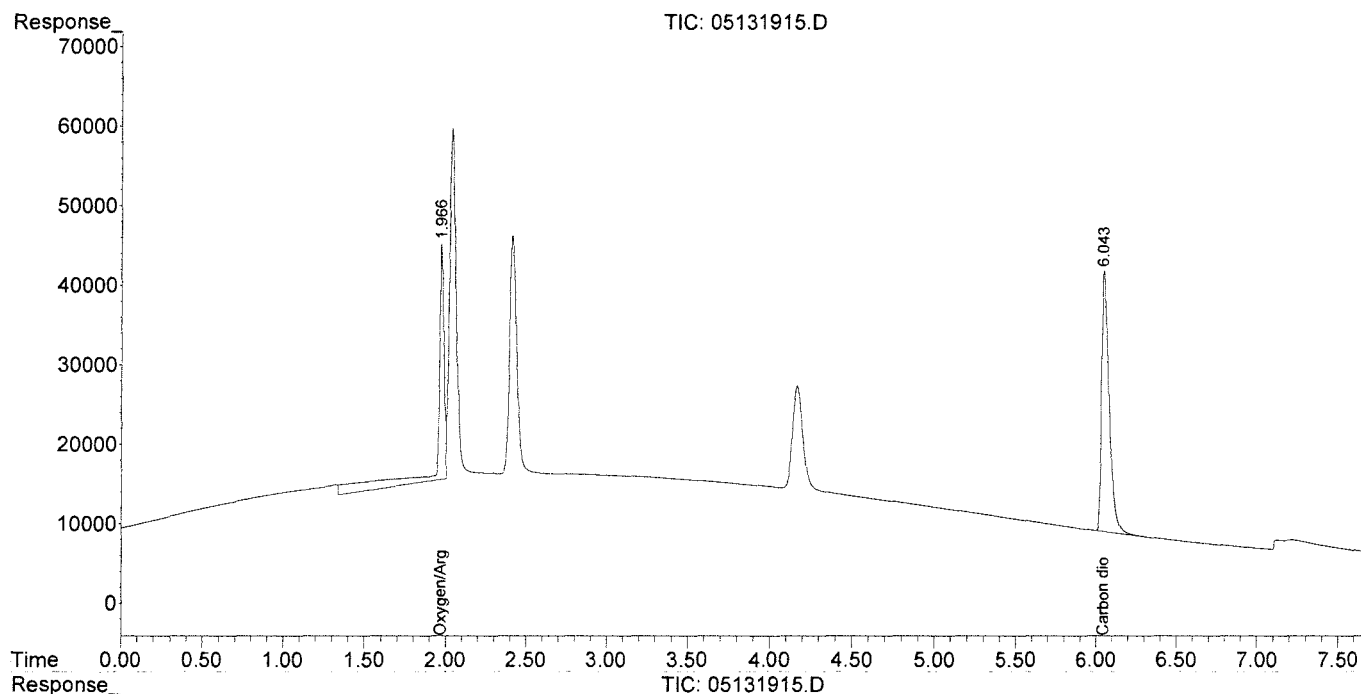
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\13\  
Data File : 05131915.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 13-May-2019, 14:32:20  
Operator : WH  
Sample : std s32-04251903  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 13 14:41:16 2019  
Quant Method : J:\GC10\METHODS\RS082817\_CO2.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Tue Aug 29 16:13:13 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



[illegible]

[illegible]



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
 Data File : 05071911.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 07-May-2019, 15:22:32  
 Operator : WH  
 Sample : P1902518-001 0.1ml  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: May 07 17:08:54 2019  
 Quant Method : I:\GC10\METHODS\RS091217\_R.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 QLast Update : Wed Sep 13 11:14:47 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.115 | 646      | 0.071 | ppm m |
| 7) Ethylene        | 0.000 | 0        | N.D.  | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.  | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.  | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.  | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.  | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.  | ppm   |
| -----              |       |          |       |       |

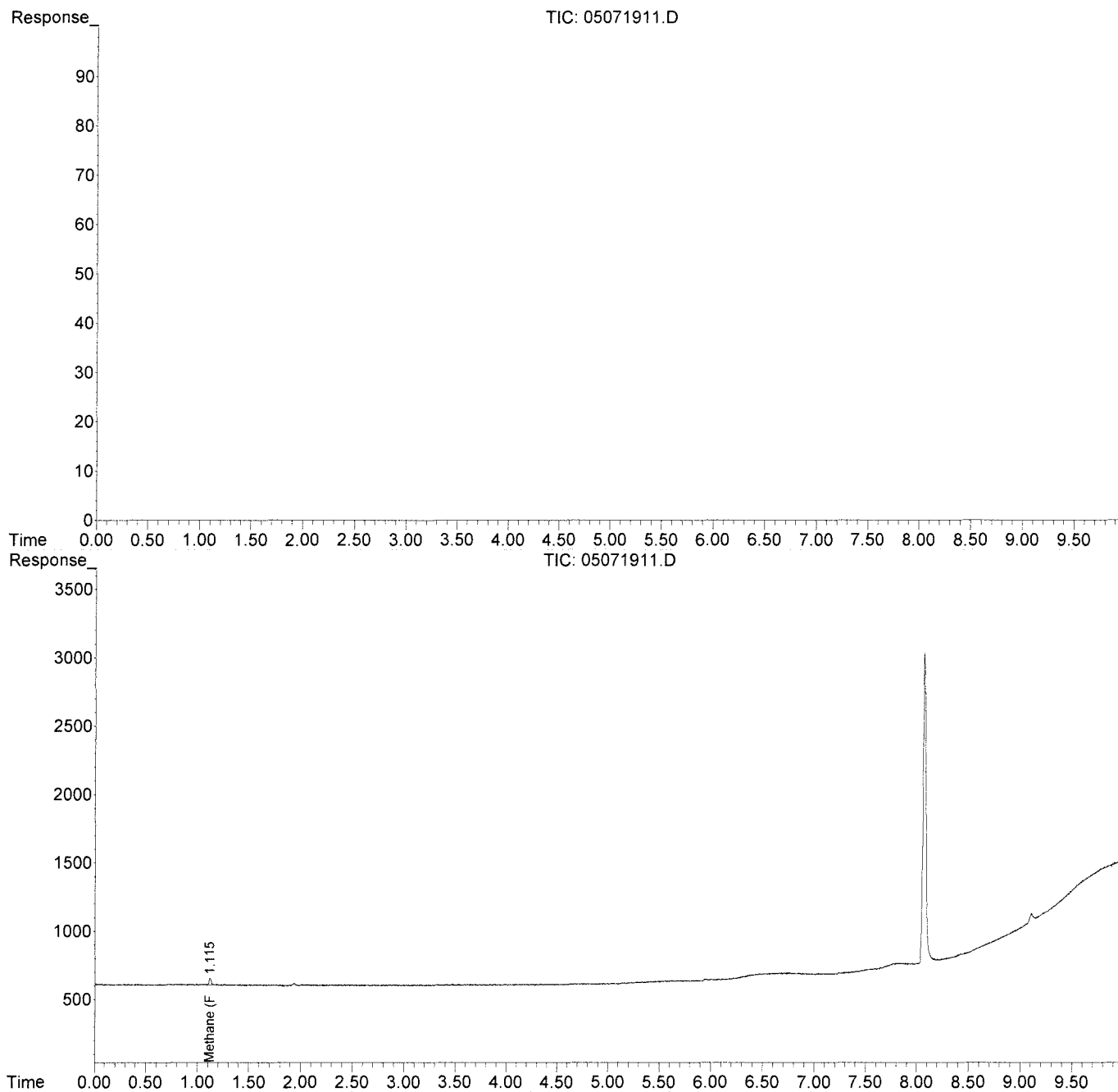
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071911.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:22:32  
Operator : WH  
Sample : P1902518-001 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:54 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

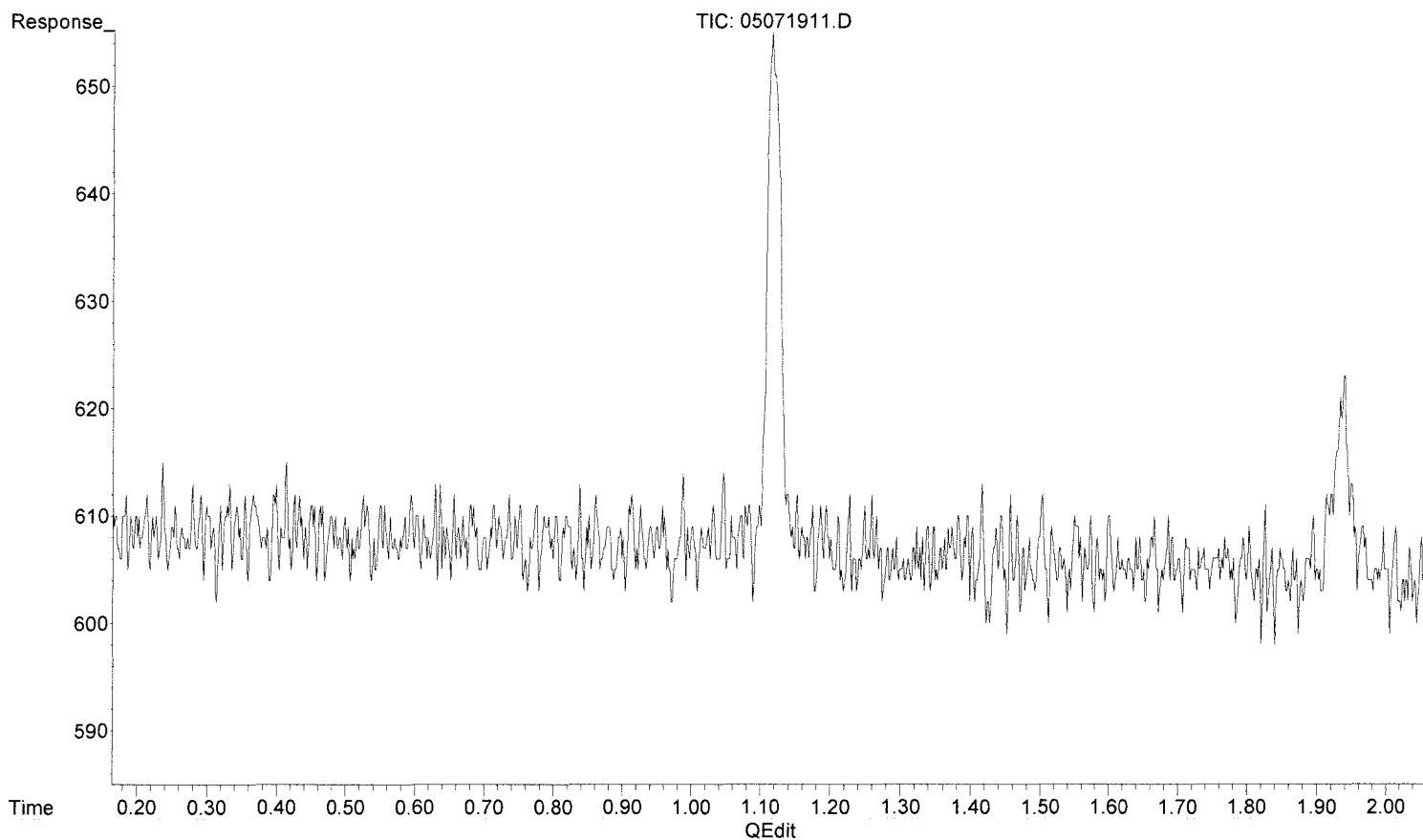
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071911.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:22:32  
Operator : WH  
Sample : P1902518-001 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:54 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

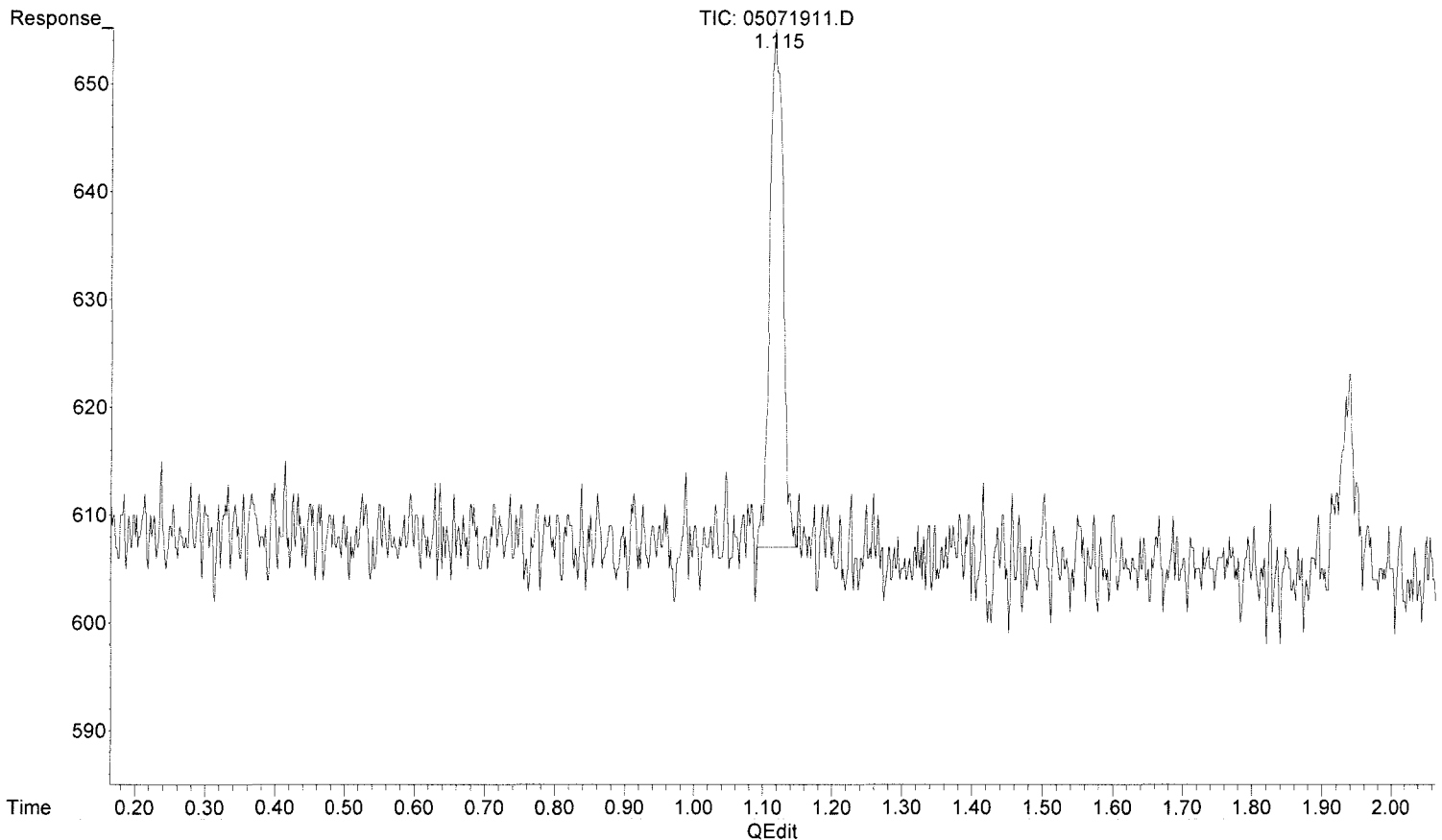
1.115min 0.000 ppm

response 0

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071911.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:22:32  
Operator : WH  
Sample : P1902518-001 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:54 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.115min 0.071 ppm m

response 646

MR  
5/13/19

W.S. / 1.1.19  
MR

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071912.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:42:23  
Operator : WH  
Sample : P1902518-002 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:58 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.113 | 599      | 0.066 | ppm m |
| 7) Ethylene        | 0.000 | 0        | N.D.  | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.  | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.  | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.  | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.  | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.  | ppm   |
| -----              |       |          |       |       |

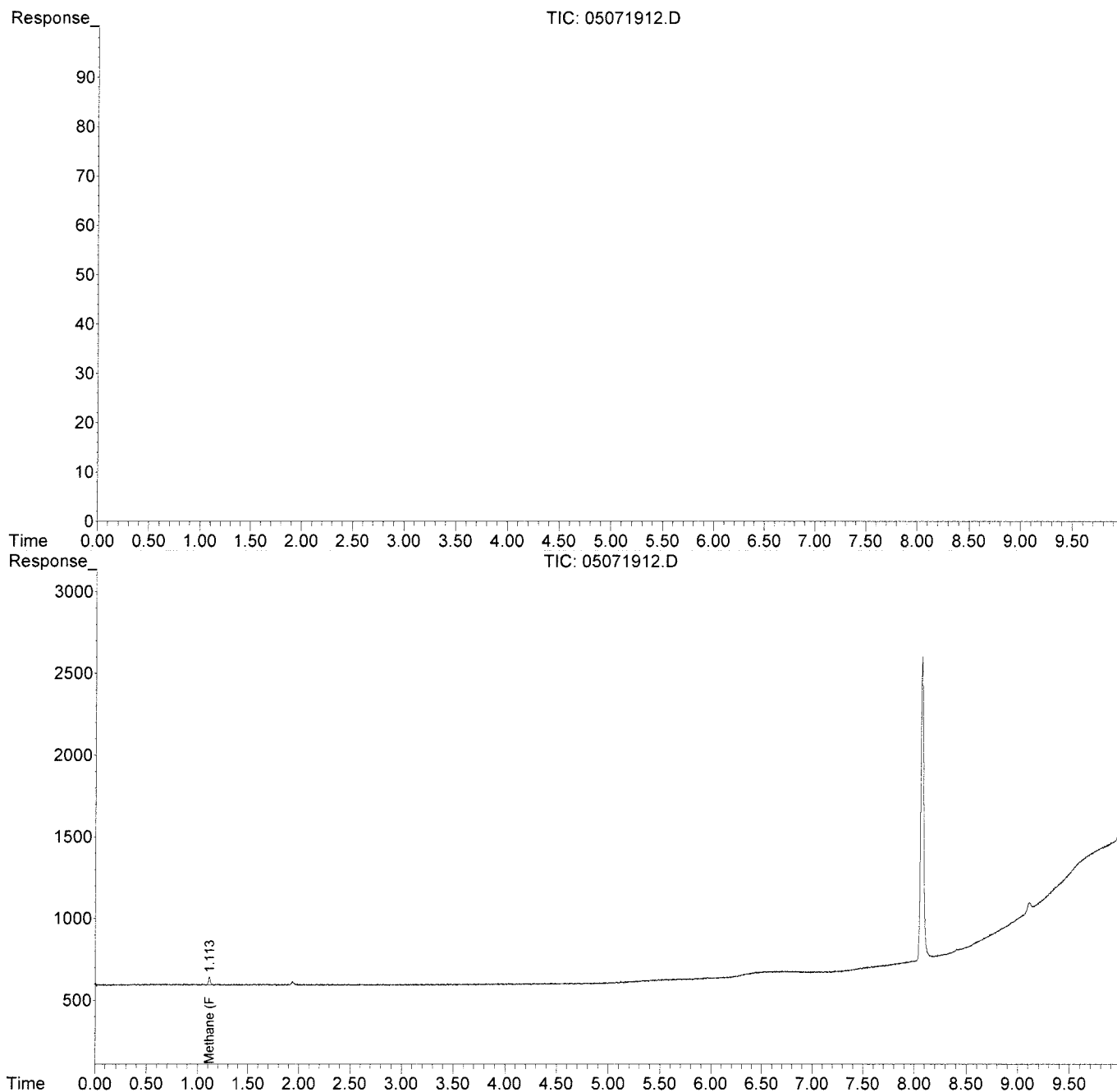
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071912.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:42:23  
Operator : WH  
Sample : P1902518-002 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:58 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

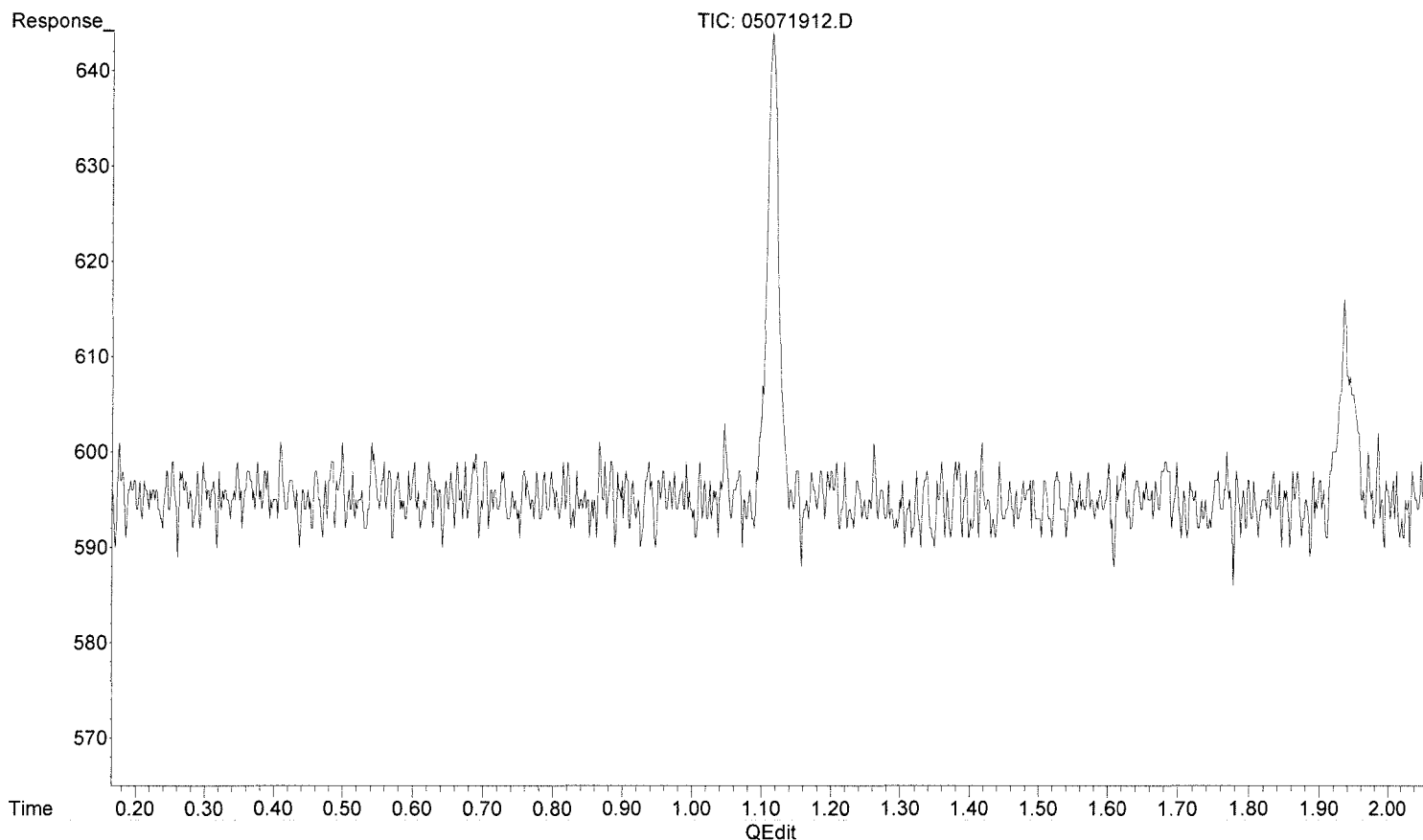
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071912.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:42:23  
Operator : WH  
Sample : P1902518-002 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:58 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.115min 0.000 ppm

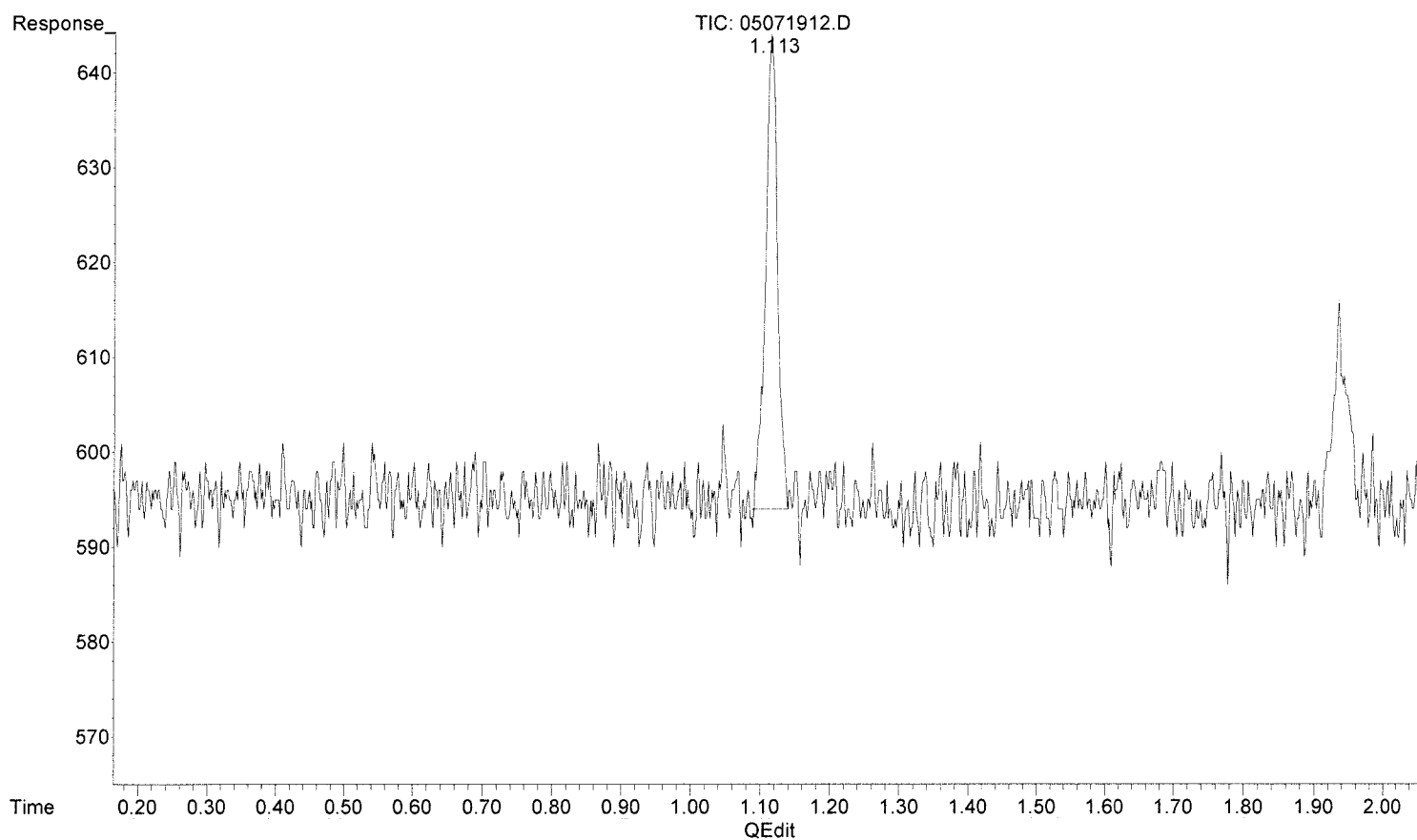
response 0



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071912.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:42:23  
Operator : WH  
Sample : P1902518-002 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:08:58 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.113min 0.066 ppm m

response 599

MR  
5/13/19

WMS/11/19  
ms

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071913.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:55:45  
Operator : WH  
Sample : P1902518-003 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:09:02 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.112 | 12044    | 1.328 | ppm   |
| 7) Ethylene        | 0.000 | 0        | N.D.  | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.  | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.  | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.  | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.  | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.  | ppm   |
| -----              |       |          |       |       |

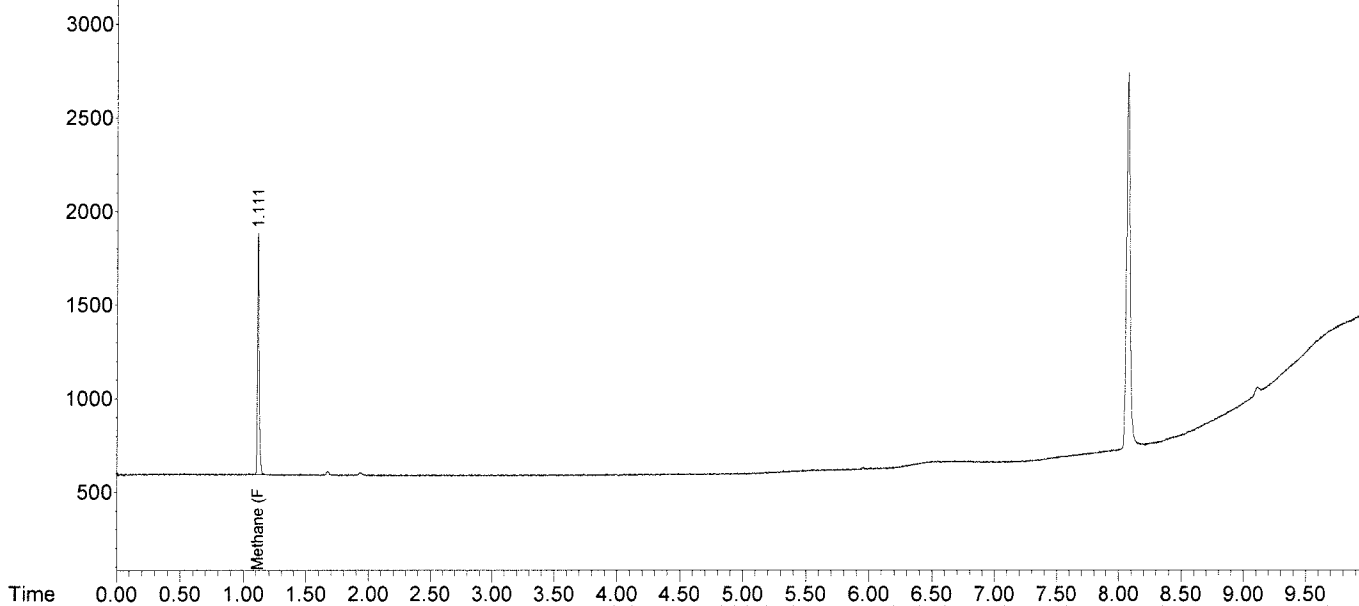
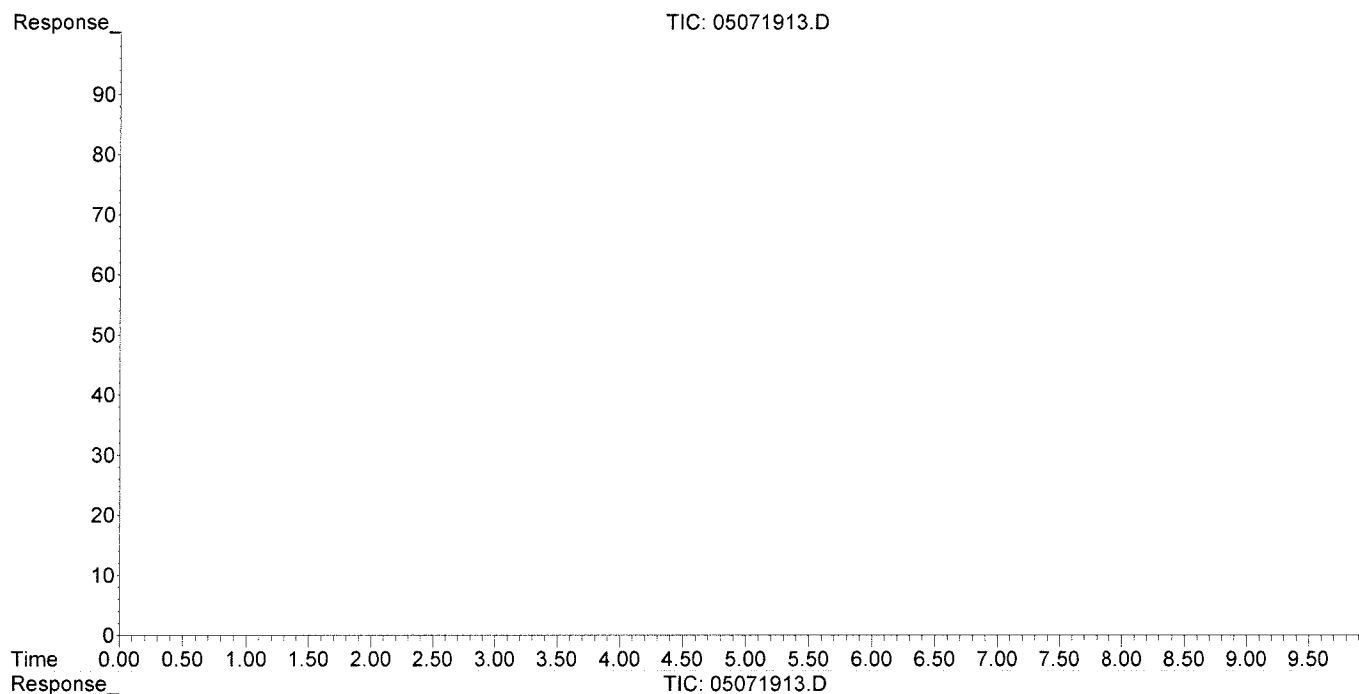
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071913.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 15:55:45  
Operator : WH  
Sample : P1902518-003 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 17:09:02 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071903.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 12:01:04  
Operator : WH  
Sample : mcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:33:48 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.106 | 860      | 0.095 | ppm m |
| 7) Ethylene        | 0.000 | 0        | N.D.  | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.  | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.  | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.  | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.  | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.  | ppm   |
| -----              |       |          |       |       |

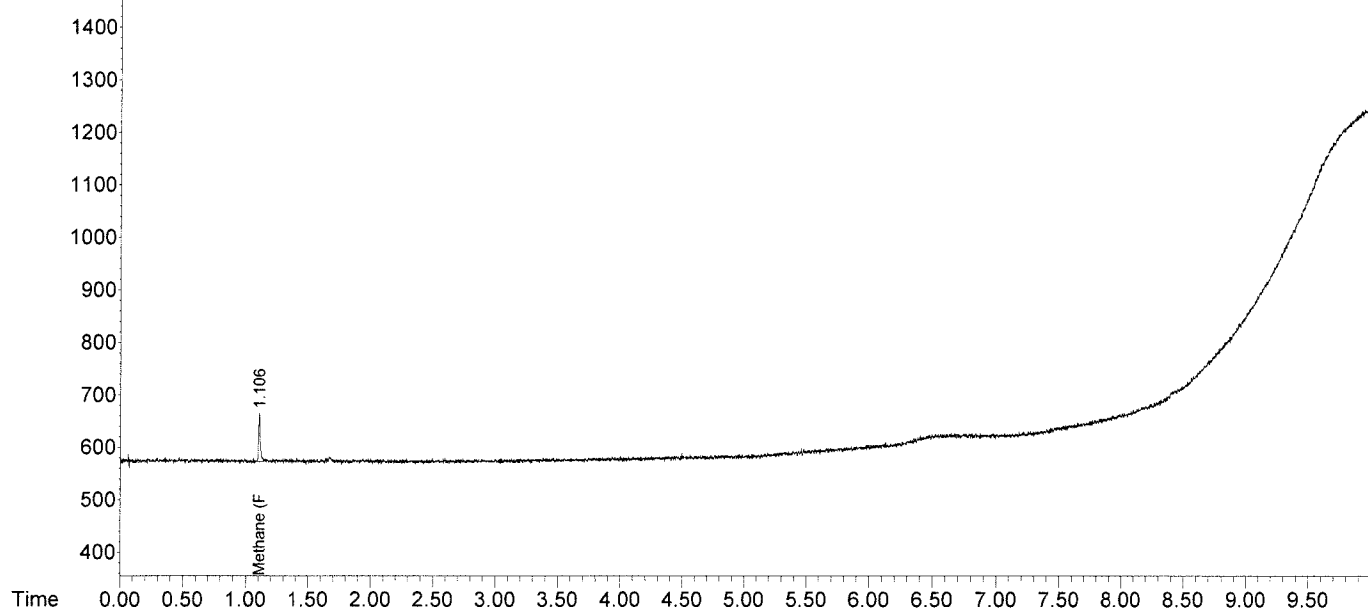
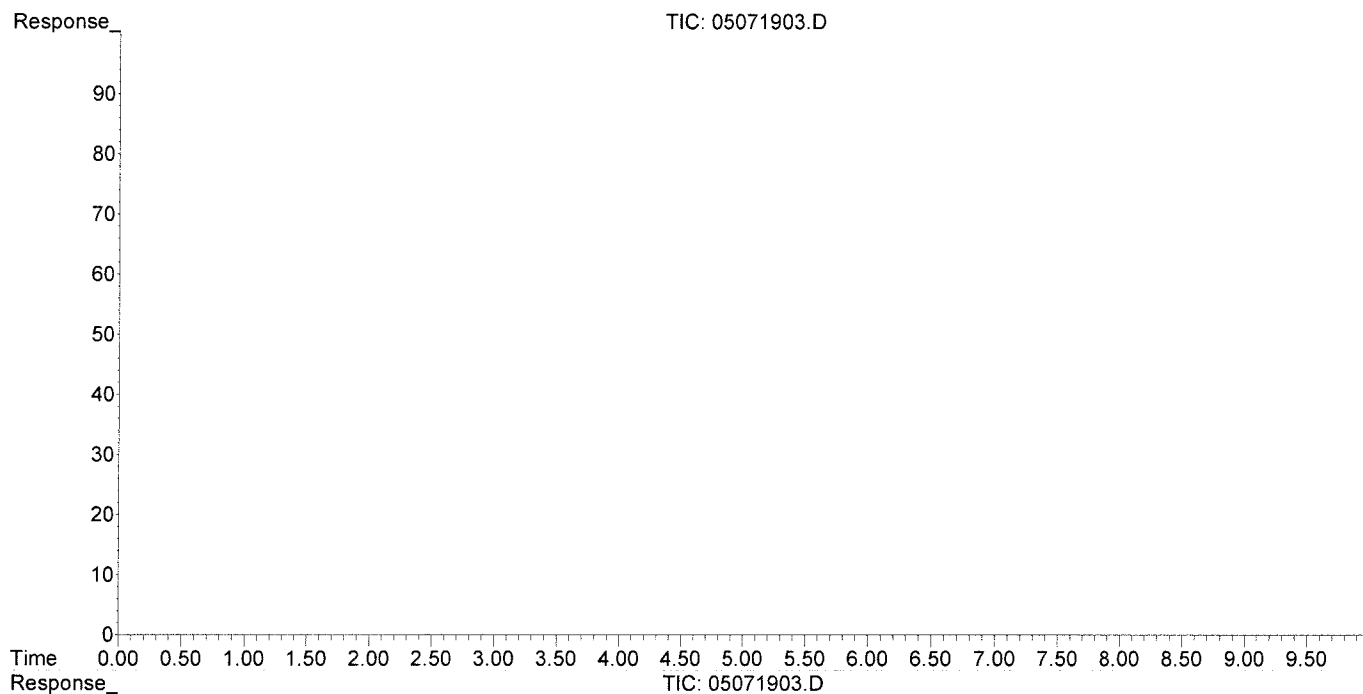
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071903.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 12:01:04  
Operator : WH  
Sample : mcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:33:48 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

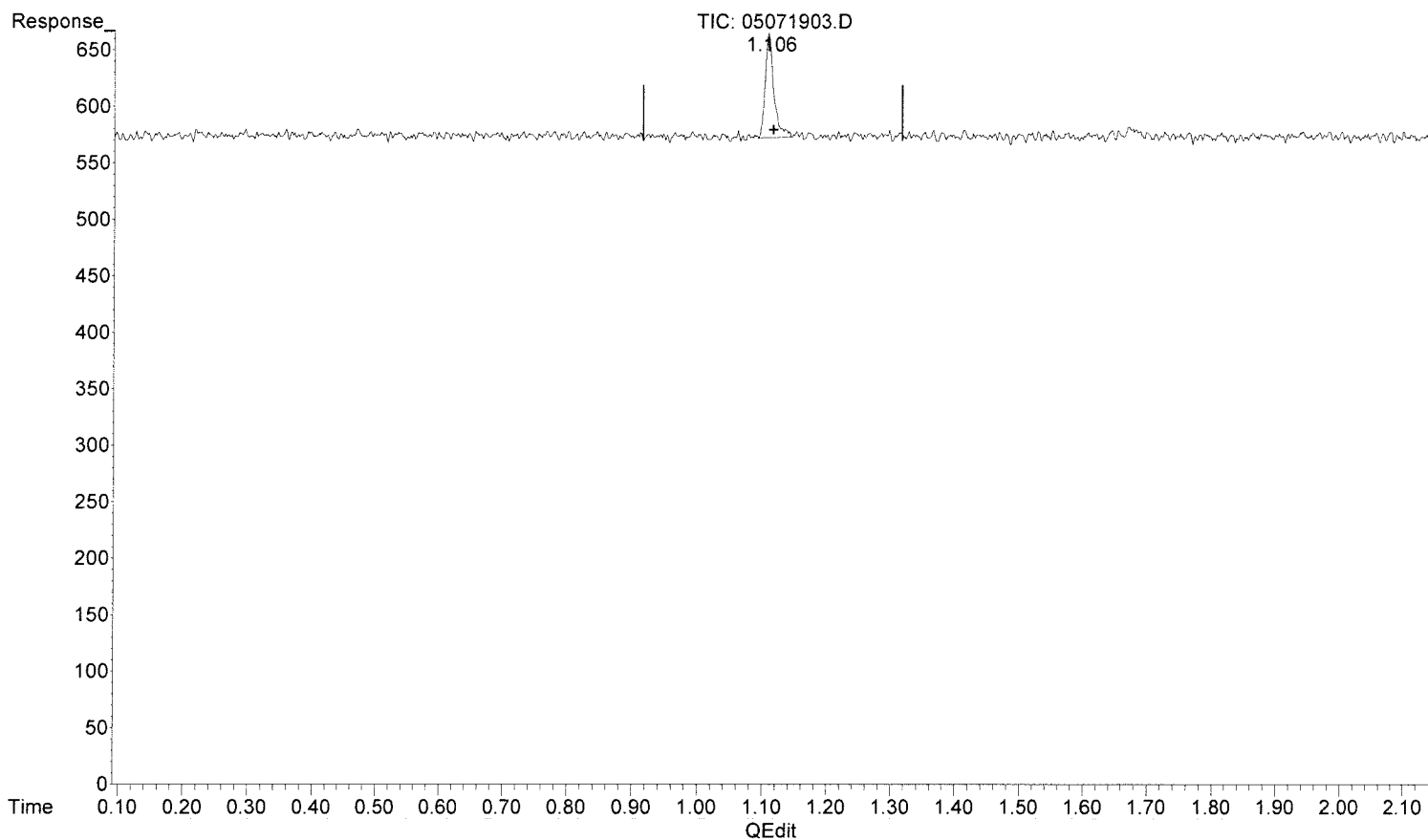
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071903.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 12:01:04  
Operator : WH  
Sample : mcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:33:48 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.106min 0.095 ppm m

response 860

MR  
5/13/19

WMS 11/14  
no previous  
MP

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071904.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 12:38:57  
Operator : WH  
Sample : fid lcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:35:23 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound         |                 | R.T.  | Response | Conc  | Units |
|------------------|-----------------|-------|----------|-------|-------|
| -----            |                 |       |          |       |       |
| Target Compounds |                 |       |          |       |       |
| 1)               | Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2)               | Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3)               | Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4)               | Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6)               | Methane (FID)   | 1.112 | 12902    | 1.422 | ppm   |
| 7)               | Ethylene        | 1.676 | 16615    | 0.993 | ppm   |
| 8)               | Ethane          | 1.939 | 20698    | 1.221 | ppm   |
| 9)               | Propylene       | 4.319 | 22550    | 0.962 | ppm   |
| 10)              | Propane         | 4.442 | 32654    | 1.312 | ppm   |
| 11)              | Isobutylene     | 0.000 | 0        | N.D.  | ppm   |
| 12)              | Isobutane       | 6.657 | 43849    | 1.647 | ppm   |
| 13)              | n-Butane        | 6.657 | 43849    | 1.647 | ppm   |
| -----            |                 |       |          |       |       |

(f)=RT Delta > 1/2 Window

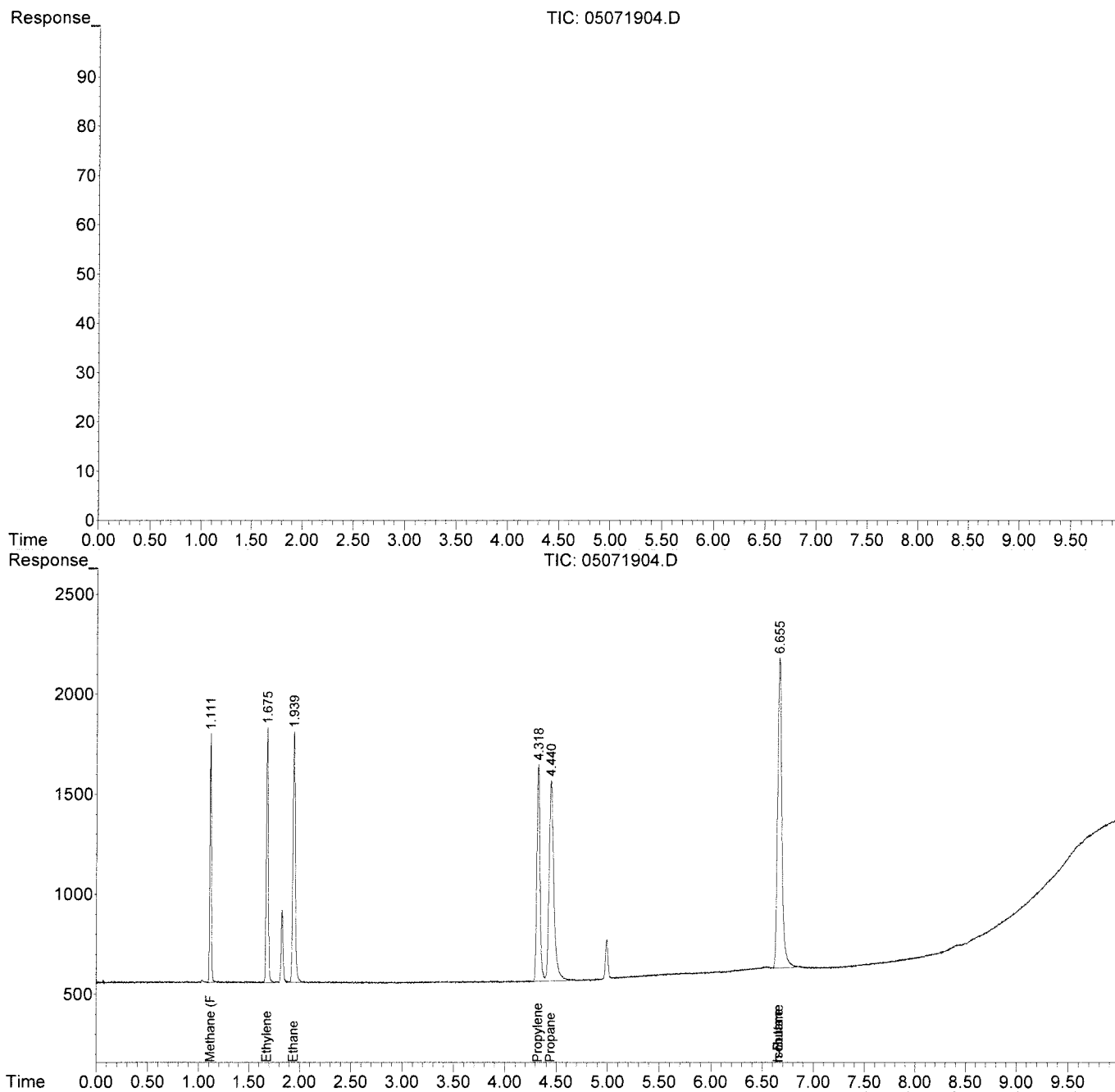
(m)=manual int.



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071904.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 12:38:57  
Operator : WH  
Sample : fid lcs 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:35:23 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071905.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 13:13:46  
Operator : WH  
Sample : fid lcsd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:35:39 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.115 | 12863    | 1.418 | ppm   |
| 7) Ethylene        | 1.678 | 17106    | 1.022 | ppm   |
| 8) Ethane          | 1.941 | 21503    | 1.269 | ppm   |
| 9) Propylene       | 4.316 | 23640    | 1.009 | ppm   |
| 10) Propane        | 4.438 | 34356    | 1.381 | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.653 | 48963    | 1.839 | ppm   |
| 13) n-Butane       | 6.653 | 48963    | 1.839 | ppm   |
| -----              |       |          |       |       |

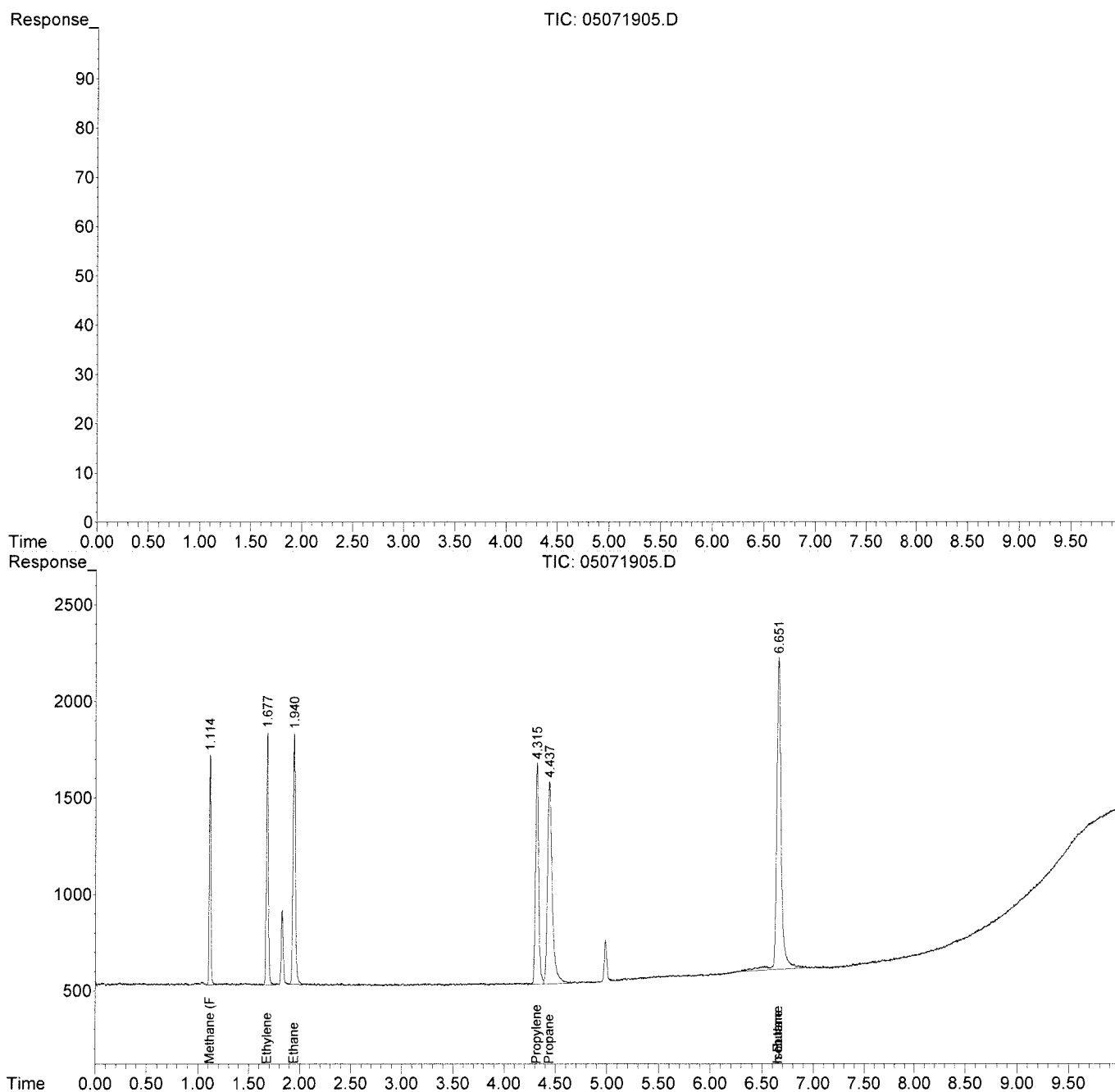
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071905.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 13:13:46  
Operator : WH  
Sample : fid lcsd 0.1ml  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 13:35:39 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Method Path : J:\GC10\METHODS\  
 Method File : RS091217\_R.M  
 Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 Last Update : Wed Sep 13 11:14:47 2017  
 Response Via : Initial Calibration

## Calibration Files

1 =09121702.D 2 =09121703.D 3 =09121704.D  
 4 =09121705.D 5 =09121706.D 6 =09121707.D

|    | Compound        | 1     | 2     | 3     | 4     | 5     | 6     | Avg      | %RSD   |
|----|-----------------|-------|-------|-------|-------|-------|-------|----------|--------|
| 1) | Oxygen/Argon    | 3.739 |       | 1.014 |       |       | 0.001 | 0.793 E6 | 189.17 |
| 2) | Carbon monoxide | 3.739 |       | 1.014 |       |       | 0.001 | 0.594 E6 | 221.92 |
| 3) | Methane (TCD)   |       |       |       |       |       | 2.161 | 0.951 E2 | 106.37 |
| 4) | Carbon dioxide  | 2.365 | 2.569 | 2.558 | 2.361 | 2.459 | 2.314 | 2.438 E2 | 4.44   |

## Signal #2 Calibration Files

1 =09121702.D 2 =09121703.D 3 =09121704.D  
 4 =09121705.D 5 =09121706.D 6 =09121707.D

|     | Compound      | 1     | 2     | 3     | 4     | 5     | 6     | Avg      | %RSD   |
|-----|---------------|-------|-------|-------|-------|-------|-------|----------|--------|
| 6)  | Methane (FID) |       | 1.180 | 0.975 | 0.908 | 0.870 | 0.868 | 0.907 E4 | 11.66  |
| 7)  | Ethylene      | 1.736 | 1.638 | 1.780 | 1.720 | 1.628 | 1.670 | 1.673 E4 | 3.90   |
| 8)  | Ethane        | 1.781 | 1.676 | 1.784 | 1.730 | 1.692 | 1.675 | 1.695 E4 | 3.83   |
| 9)  | Propylene     | 2.505 | 2.296 | 2.592 | 2.480 | 2.346 | 2.252 | 2.343 E4 | 6.56   |
| 10) | Propane       | 2.439 | 2.283 | 2.645 | 2.555 | 2.433 | 2.522 | 2.488 E4 | 4.20   |
| 11) | Isobutylene   |       |       |       |       |       |       | 0.652 E1 | 138.46 |
| 12) | Isobutane     | 6.058 | 4.793 | 2.214 | 1.553 | 1.353 |       | 2.662 E4 | 86.17  |
| 13) | n-Butane      | 6.058 | 4.793 | 2.214 | 1.553 | 1.353 |       | 2.662 E4 | 86.17  |

(#) = Out of Range ### Number of calibration levels exceeded format ###

RS091217\_R.M Wed Sep 13 15:11:48 2017

Edit Compounds -- Compound #6 -- Methane (FID)

Search by: ☒ Ret Time☐ Name☐ Index

Find Compound

Compound Database  
External Standard Compound

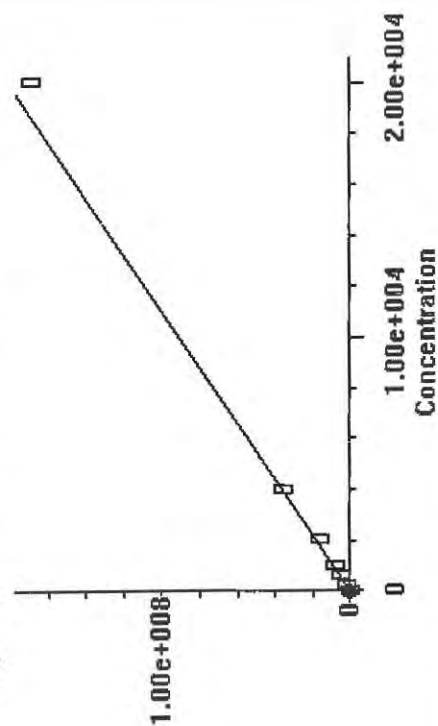
- ☒ Oxygen/Argon  
☒ Carbon monoxide  
☒ Methane (TCD)  
☒ Carbon dioxide  
☒ Signal #2  
☒ **Methane (FID)**  
☒ Ethylene  
☒ Ethane  
☒ Propylene  
☒ Propane  
☒ Isobutylene  
☒ Isobutane  
☒ n-Butane

Identification Calibration User-Defined Advanced Reporting

| Lvl ID | Concentration | Response        | Lvl ID | Concentration | Response        |
|--------|---------------|-----------------|--------|---------------|-----------------|
| 1      | 0.151000      |                 | 11     | 20000.000000  | 169009160.49199 |
| 2      | 0.302000      | 3564.400000     |        |               |                 |
| 3      | 1.510000      | 14725.266625    |        |               |                 |
| 4      | 4.530000      | 41128.575000    |        |               |                 |
| 5      | 10.570000     | 91966.784531    |        |               |                 |
| 6      | 200.000000    | 1735997.497500  |        |               |                 |
| 7      | 600.000000    | 5189848.900000  |        |               |                 |
| 8      | 1000.000000   | 8598533.570000  |        |               |                 |
| 9      | 2000.000000   | 16098208.390000 |        |               |                 |
| 10     | 4000.000000   | 35776839.311362 |        |               |                 |

Methane (FID)

Response



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 9.071e+003 | Linear term    |
| 0.000e+000 | Constant term  |
| 11.657%    | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve

## Edit Compounds -- Compound #7 -- Ethylene

Search by: ☒ Ret Time☐ Name☐ Index

Find Compound

☐ Compound Database  
☒ External Standard Compound

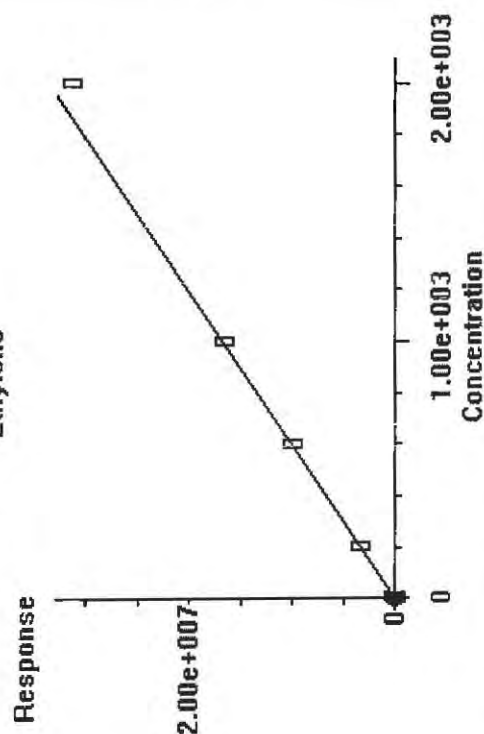
Identification    Calibration    User-Defined    Advanced    Reporting

☒ Oxygen/Argon  
☒ Carbon monoxide  
☒ Methane (TCD)  
☒ Carbon dioxide  
☒ Signal #2  
☒ Methane (FID)  
☒ **Ethylene**  
☒ Ethane  
☒ Propylene  
☒ Propane  
☒ Isobutylene  
☒ Isobutane  
☒ n-Butane

| Lvl ID | Concentration | Response        |
|--------|---------------|-----------------|
| 1      | 0.151000      | 2621.970000     |
| 2      | 0.302000      | 4946.731301     |
| 3      | 1.510000      | 26884.746847    |
| 4      | 4.530000      | 77902.721497    |
| 5      | 10.570000     | 172085.529560   |
| 6      | 200.000000    | 33339702.313219 |
| 7      | 600.000000    | 10007758.776971 |
| 8      | 1000.000000   | 16609503.805988 |
| 9      | 2000.000000   | 31192443.898600 |
| 10     | 4000.000000   |                 |

| Lvl ID | Concentration | Response |
|--------|---------------|----------|
| 11     | 20000.000000  |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |

Ethylene



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 1.673e+004 | Linear term    |
| 0.000e+000 | Constant term  |
| 3.897%     | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve

Edit Compounds: -- Compound #8 -- Ethane

Find Compound

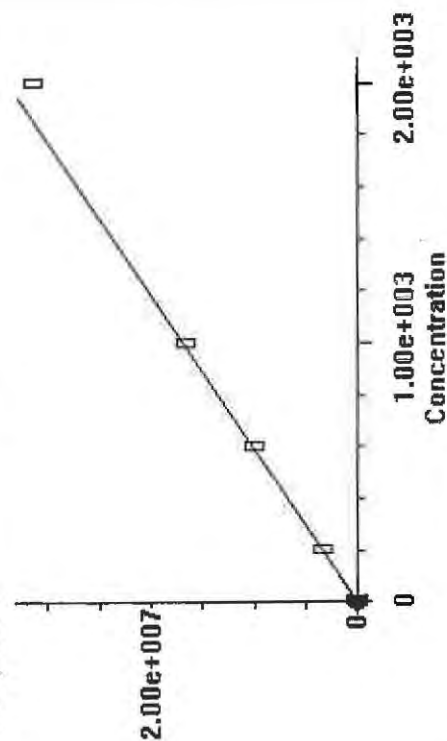
Search by ☒ Rel Time☐ Name☐ Index
☒ Compound Database  
☒ External Standard Compound

Identification   Calibration   User-Defined   Advanced   Reporting

| Compound Database                                   | External Standard Compound | Lvl ID | Concentration | Response        | Lvl ID | Concentration | Response |
|---|----------------------------|--------|---------------|-----------------|--------|---------------|----------|
| <input checked="" type="checkbox"/> Oxygen/Argon    | <input type="checkbox"/>   | 1      | 0.151000      | 2689.928008     | 11     | 20000.000000  |          |
| <input checked="" type="checkbox"/> Carbon monoxide | <input type="checkbox"/>   | 2      | 0.302000      | 5060.331943     |        |               |          |
| <input checked="" type="checkbox"/> Methane (TCD)   | <input type="checkbox"/>   | 3      | 1.510000      | 26943.657500    |        |               |          |
| <input checked="" type="checkbox"/> Carbon dioxide  | <input type="checkbox"/>   | 4      | 4.530000      | 79353.525045    |        |               |          |
| <input checked="" type="checkbox"/> Signal #2       | <input type="checkbox"/>   | 5      | 10.570000     | 178840.731148   |        |               |          |
| <input checked="" type="checkbox"/> Methane (FID)   | <input type="checkbox"/>   | 6      | 200.000000    | 3350442.319129  |        |               |          |
| <input checked="" type="checkbox"/> Ethylene        | <input type="checkbox"/>   | 7      | 600.000000    | 10048964.218029 |        |               |          |
| <input checked="" type="checkbox"/> Ethane          | <input type="checkbox"/>   | 8      | 1000.000000   | 16703164.879012 |        |               |          |
| <input checked="" type="checkbox"/> Propylene       | <input type="checkbox"/>   | 9      | 2000.000000   | 31424217.938900 |        |               |          |
| <input checked="" type="checkbox"/> Propane         | <input type="checkbox"/>   | 10     | 4000.000000   |                 |        |               |          |
| <input checked="" type="checkbox"/> Isobutylene     | <input type="checkbox"/>   |        |               |                 |        |               |          |
| <input checked="" type="checkbox"/> Isobutane       | <input type="checkbox"/>   |        |               |                 |        |               |          |
| <input checked="" type="checkbox"/> n-Butane        | <input type="checkbox"/>   |        |               |                 |        |               |          |

Ethane

Response



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 1.695e+004 | Linear term    |
| 0.000e+000 | Constant term  |
| 3.831%     | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve



## Edit Compounds -- Compound #9 -- Propylene

Find Compound

Index

Name

Search by Ret Time

Identification Calibration User-Defined Advanced Reporting

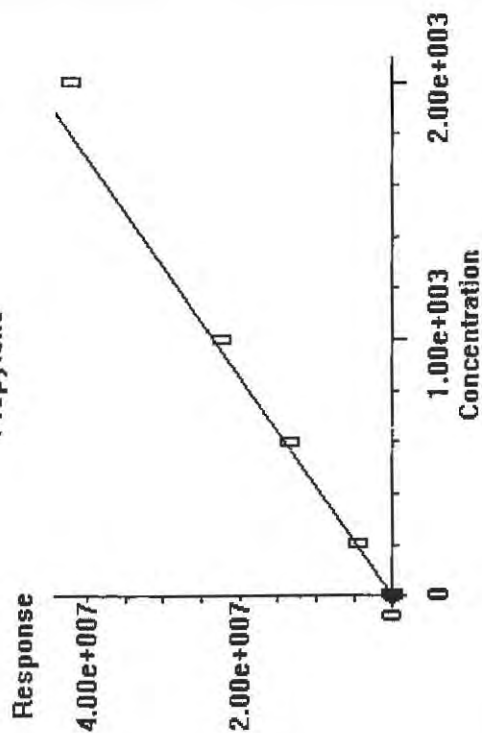
Compound Database  
External Standard Compound

☐ Oxygen/Argon  
☐ Carbon monoxide  
☐ Methane (TCD)  
☐ Carbon dioxide  
☐ Signal #2  
☐ Methane (FID)  
☐ Ethylene  
☐ Ethane  
☒ Propylene  
☐ Propane  
☐ Isobutylene  
☐ Isobutane  
☐ n-Butane

| Lvl ID | Concentration | Response |
|--------|---------------|----------|
| 11     | 20000.000000  |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |
|        |               |          |

| Lvl ID | Concentration | Response        |
|--------|---------------|-----------------|
| 1      | 0.151000      | 3782.537646     |
| 2      | 0.302000      | 6933.285530     |
| 3      | 1.510000      | 39139.518208    |
| 4      | 4.530000      | 112341.896872   |
| 5      | 10.570000     | 248003.903623   |
| 6      | 200.000000    | 4504060.086084  |
| 7      | 600.000000    | 13569342.761419 |
| 8      | 1000.000000   | 22494887.720990 |
| 9      | 2000.000000   | 42124689.656800 |
| 10     | 4000.000000   |                 |

Propylene



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 2.343e+004 | Linear term    |
| 0.000e+000 | Constant term  |
| 6.559%     | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve

Edit Compounds --- Compound #10 --- Propane

Search by Ret Time

Name

Index

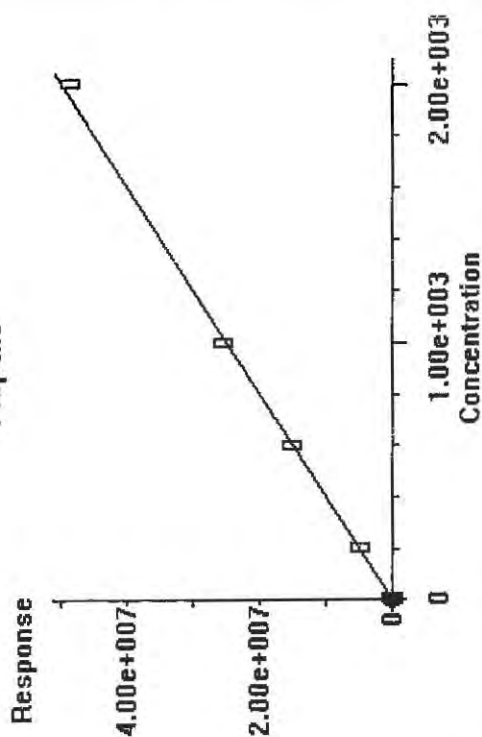
Find Compound

☒ Compound Database  
☒ External Standard Compound

Identification Calibration User-Defined Advanced Reporting

| Compound Database                                   | External Standard Compound | Lvl ID | Concentration | Response        | Lvl ID | Concentration | Response |
|---|----------------------------|--------|---------------|-----------------|--------|---------------|----------|
| <input checked="" type="checkbox"/> Oxygen/Argon    |                            | 1      | 0.151000      | 3682.897354     | 11     | 20000.000000  |          |
| <input checked="" type="checkbox"/> Carbon monoxide |                            | 2      | 0.302000      | 6894.237803     |        |               |          |
| <input checked="" type="checkbox"/> Methane (TCD)   |                            | 3      | 1.510000      | 39934.166792    |        |               |          |
| <input checked="" type="checkbox"/> Carbon dioxide  |                            | 4      | 4.530000      | 115723.428128   |        |               |          |
| <input checked="" type="checkbox"/> Signal #2       |                            | 5      | 10.570000     | 257124.432806   |        |               |          |
| <input checked="" type="checkbox"/> Methane (FID)   |                            | 6      | 200.000000    | 5043035.663316  |        |               |          |
| <input checked="" type="checkbox"/> Ethylene        |                            | 7      | 600.000000    | 15251325.797404 |        |               |          |
| <input checked="" type="checkbox"/> Ethane          |                            | 8      | 1000.000000   | 25459410.657938 |        |               |          |
| <input checked="" type="checkbox"/> Propylene       |                            | 9      | 2000.000000   | 48583085.287451 |        |               |          |
| <input checked="" type="checkbox"/> Propane         |                            | 10     | 4000.000000   |                 |        |               |          |
| <input checked="" type="checkbox"/> Isobutylene     |                            |        |               |                 |        |               |          |
| <input checked="" type="checkbox"/> Isobutane       |                            |        |               |                 |        |               |          |
| <input checked="" type="checkbox"/> n-Butane        |                            |        |               |                 |        |               |          |

Propane



|            |                |
|------------|----------------|
| 0.000e+000 | Quadratic term |
| 2.488e+004 | Linear term    |
| 0.000e+000 | Constant term  |
| 4.200%     | RF Rel Std Dev |

OK

Cancel

Help

Print Calibration Curve

Copy Calibration Curve

Method Path : J:\GC10\METHODS\  
 Method File : RS091217\_R.M  
 Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 Last Update : Wed Sep 13 11:14:47 2017  
 Response Via : Initial Calibration

| #  | ID | Conc  | ISTD<br>Conc | Path\File                                  |
|----|----|-------|--------------|--|
| 1  | 1  | 0     | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121702.D |
| 2  | 2  | 0     | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121703.D |
| 3  | 3  | 3     | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121704.D |
| 4  | 4  | 10    | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121705.D |
| 5  | 5  | 25    | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121706.D |
| 6  | 6  | 125   | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121707.D |
| 7  | 7  | 5000  | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121708.D |
| 8  | 8  | 25000 | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121709.D |
| 9  | 9  | 2000  | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121710.D |
| 10 | 10 | 30000 | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121711.D |
| 11 | 11 | 20000 | 0            | J:\GC10\DATA\RSK_FID\2017_09\12\09121712.D |

| #  | ID | Update Time       | Quant Time        | Acquisition Time   |
|----|----|-------------------|-------------------|--------------------|
| 1  | 1  | Sep 13 11:04 2017 | Sep 12 15:03 2017 | 12-Sep-2017, 10:52 |
| 2  | 2  | Sep 13 11:05 2017 | Sep 13 11:05 2017 | 12-Sep-2017, 11:05 |
| 3  | 3  | Sep 13 11:06 2017 | Sep 13 11:05 2017 | 12-Sep-2017, 11:45 |
| 4  | 4  | Sep 13 11:09 2017 | Sep 13 11:06 2017 | 12-Sep-2017, 12:09 |
| 5  | 5  | Sep 13 11:09 2017 | Sep 13 11:09 2017 | 12-Sep-2017, 12:30 |
| 6  | 6  | Sep 13 11:10 2017 | Sep 13 11:10 2017 | 12-Sep-2017, 12:47 |
| 7  | 7  | Sep 13 11:11 2017 | Sep 13 11:10 2017 | 12-Sep-2017, 13:00 |
| 8  | 8  | Sep 13 11:12 2017 | Sep 13 11:11 2017 | 12-Sep-2017, 13:47 |
| 9  | 9  | Sep 13 11:12 2017 | Sep 13 11:12 2017 | 12-Sep-2017, 14:07 |
| 10 | 10 | Sep 13 11:14 2017 | Sep 13 11:13 2017 | 12-Sep-2017, 14:48 |
| 11 | 11 | Sep 13 11:14 2017 | Sep 13 11:14 2017 | 12-Sep-2017, 15:21 |

RS091217\_R.M Wed Sep 13 15:11:22 2017

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121702.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 10:52  
Operator : MC  
Sample : 0.151ppm 0.250ml s32-09121702  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 12 11:03:15 2017  
Quant Method : I:\GC10\METHODS\RS082417.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Fri Aug 25 09:19:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc  | Units |
|--------------------|--------|----------|-------|-------|
| -----              |        |          |       |       |
| Target Compounds   |        |          |       |       |
| 1) Oxygen/Argon    | 1.767  | 373920   | 0.128 | ppm   |
| 2) Carbon monoxide | 1.767  | 373920   | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 0.000  | 0        | N.D.  | ppm d |
| 7) Ethylene        | 1.595  | 2622     | 0.156 | ppm   |
| 8) Ethane          | 1.848  | 2690     | 0.156 | ppm   |
| 9) Propylene       | 4.222  | 3783     | 0.154 | ppm   |
| 10) Propane        | 4.348  | 3683     | 0.139 | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.582f | 6058     | NoCal | ppm   |
| 13) n-Butane       | 6.582f | 6058     | NoCal | ppm   |
| -----              |        |          |       |       |

(f)=RT Delta > 1/2 Window

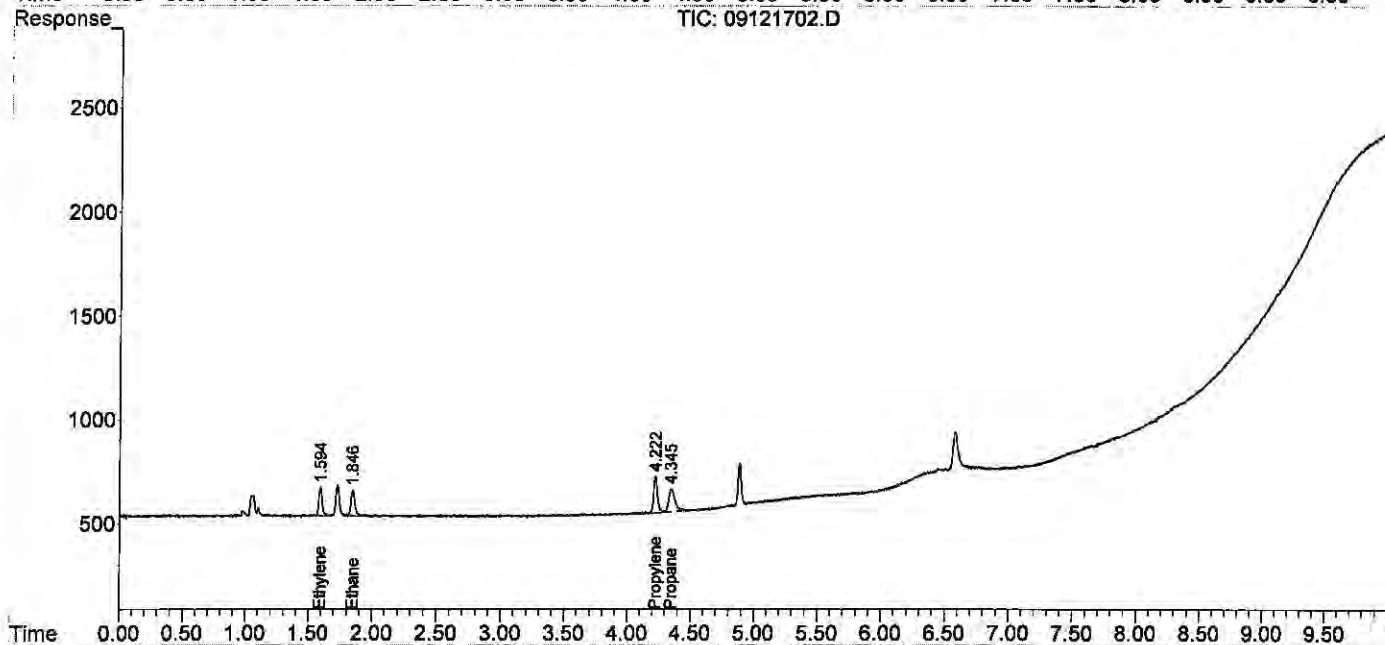
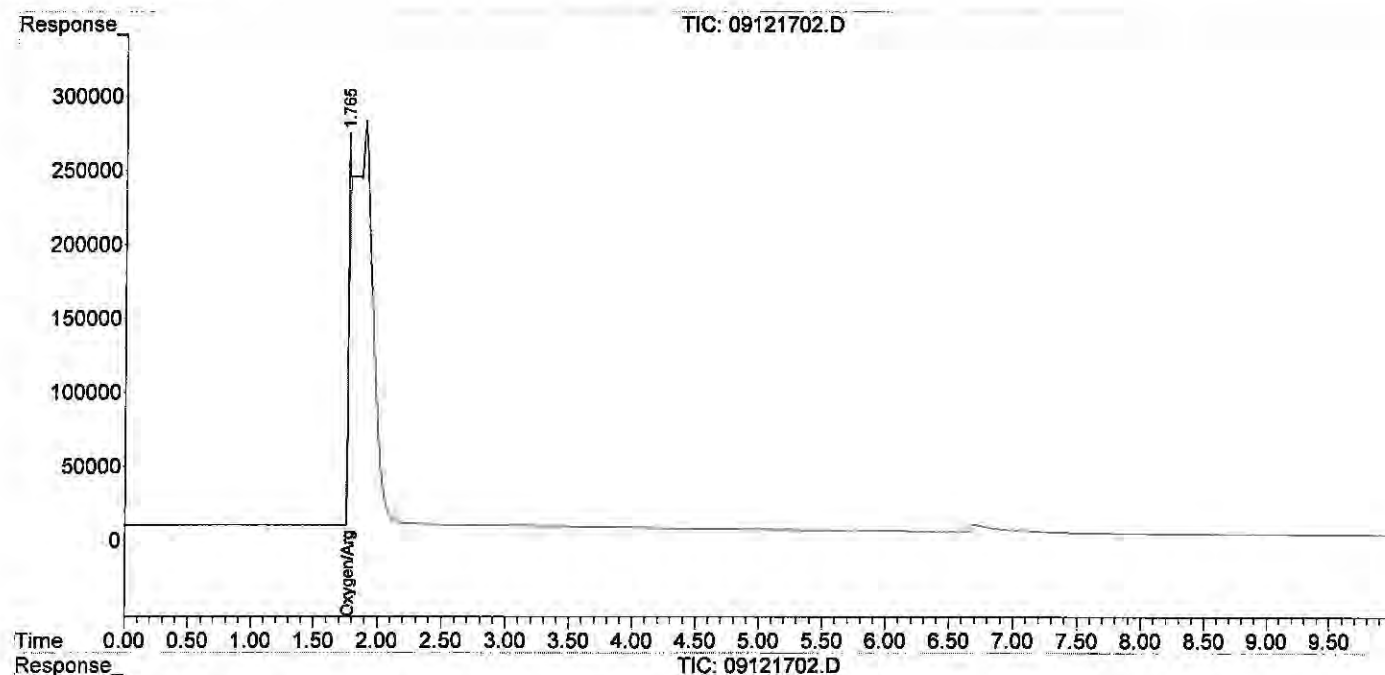
(m)=manual int.

pk 2/13/12

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121702.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 10:52  
Operator : MC  
Sample : 0.151ppm 0.250ml s32-09121702  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 12 11:03:15 2017  
Quant Method : I:\GC10\METHODS\RS082417.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Fri Aug 25 09:19:14 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121703.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 11:05  
Operator : MC  
Sample : 0.302ppm 0.5ml s32-09121702  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:05:03 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response  | Conc  | Units |
|--------------------|--------|-----------|-------|-------|
| -----              |        |           |       |       |
| Target Compounds   |        |           |       |       |
| 1) Oxygen/Argon    | 1.913f | -25181981 | N.D.  | ppm   |
| 2) Carbon monoxide | 1.913f | -25181981 | 1.089 | ppm   |
| 3) Methane (TCD)   | 0.000  | 0         | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000  | 0         | N.D.  | ppm   |
| 6) Methane (FID)   | 1.049  | 3564      | 0.391 | ppm m |
| 7) Ethylene        | 1.577  | 4947      | 0.292 | ppm   |
| 8) Ethane          | 1.828  | 5060      | 0.293 | ppm   |
| 9) Propylene       | 4.207  | 6933      | 0.281 | ppm   |
| 10) Propane        | 4.337  | 6894      | 0.268 | ppm   |
| 11) Isobutylene    | 0.000  | 0         | N.D.  | ppm   |
| 12) Isobutane      | 6.579f | 9587      | 0.158 | ppm   |
| 13) n-Butane       | 6.579f | 9587      | 0.158 | ppm   |
| -----              |        |           |       |       |

(f)=RT Delta > 1/2 Window

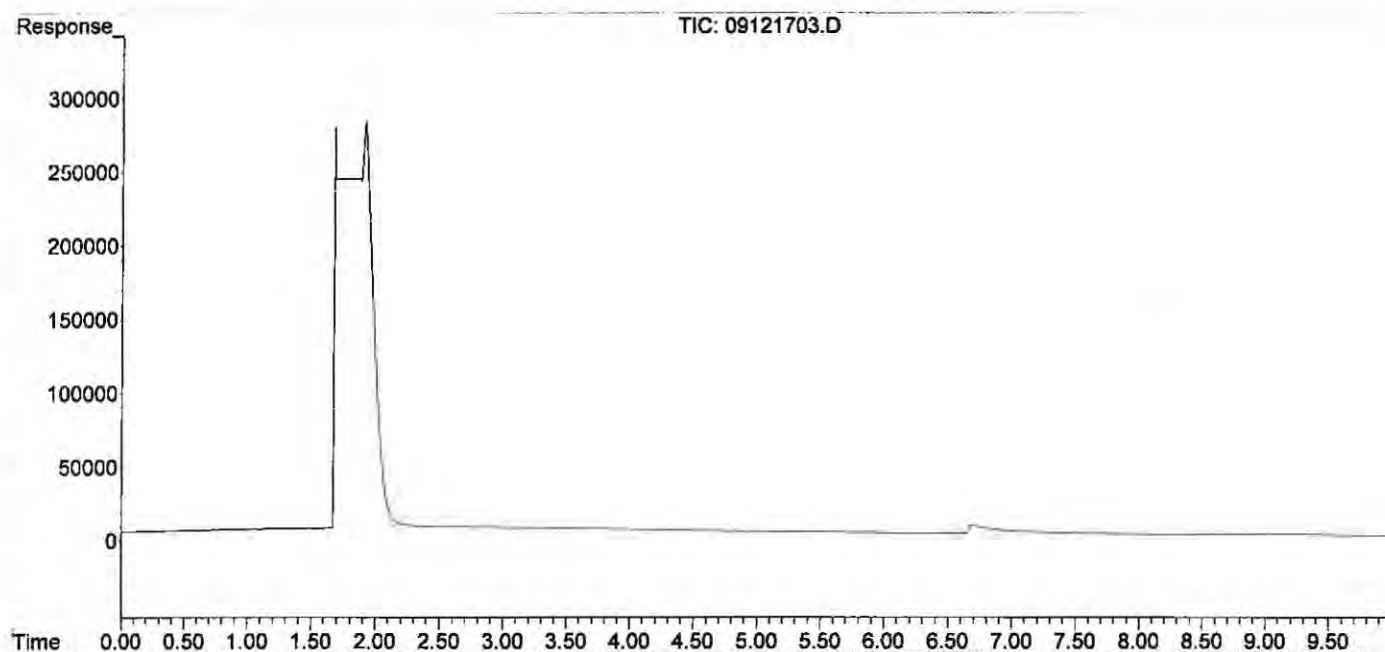
(m)=manual int.



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121703.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 11:05  
Operator : MC  
Sample : 0.302ppm 0.5ml s32-09121702  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:05:03 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

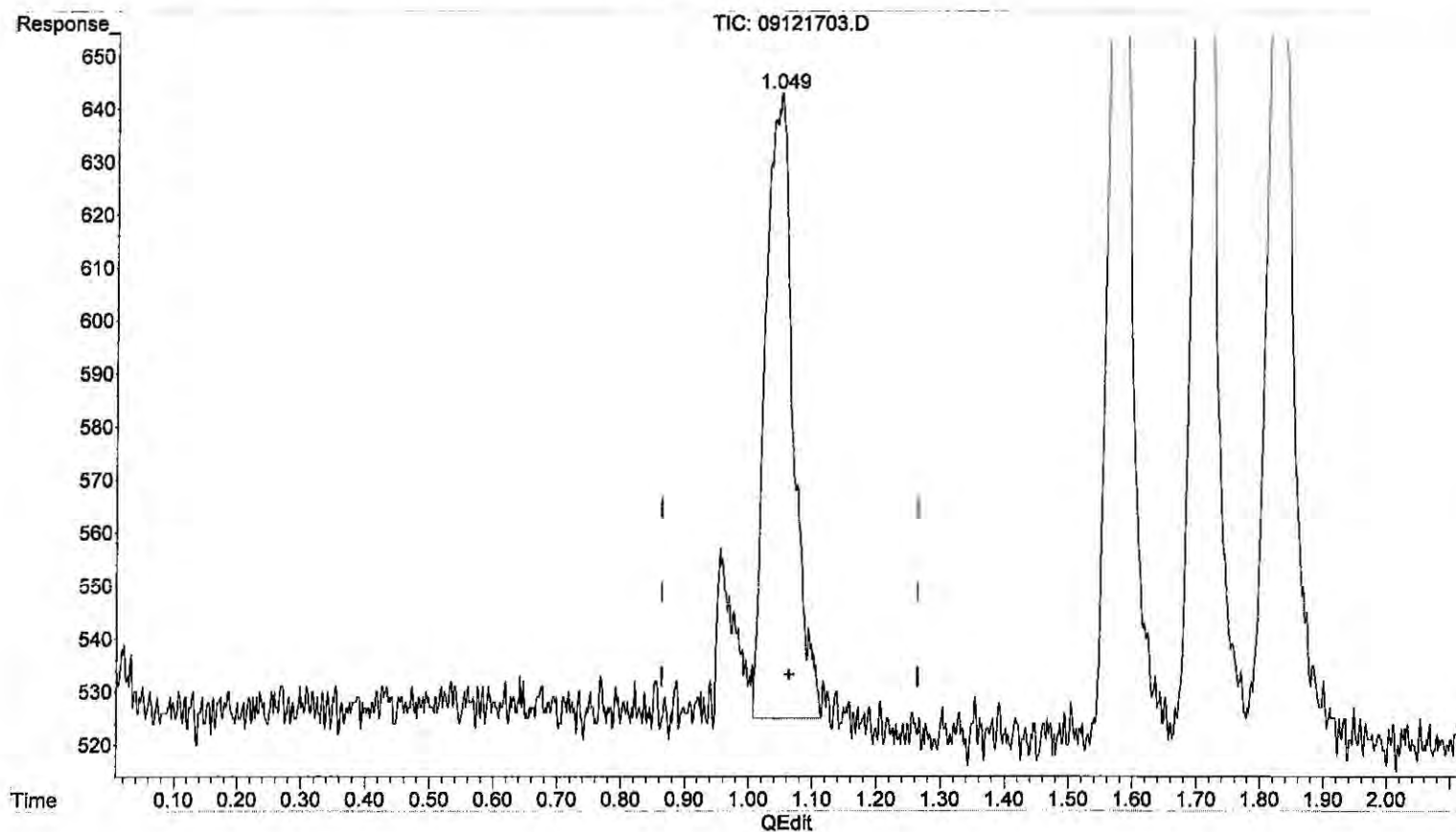




Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121703.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 11:05  
Operator : MC  
Sample : 0.302ppm 0.5ml s32-09121702  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:05:03 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(6) Methane (FID)

1.049min 0.391 ppm m

response 3564

*Handwritten notes:*  
9/13/17  
Bu  
No  
peak  
Wg/2/17

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121704.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 11:45  
Operator : MC  
Sample : 1.51ppm 0.1ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:05:55 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc  | Units |
|--------------------|--------|----------|-------|-------|
| -----              |        |          |       |       |
| Target Compounds   |        |          |       |       |
| 1) Oxygen/Argon    | 1.847  | 2536230  | 1.056 | ppm   |
| 2) Carbon monoxide | 1.847  | 2536230  | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.064  | 14725    | 1.613 | ppm   |
| 7) Ethylene        | 1.598  | 26885    | 1.582 | ppm   |
| 8) Ethane          | 1.851  | 26944    | 1.555 | ppm   |
| 9) Propylene       | 4.220  | 39140    | 1.589 | ppm   |
| 10) Propane        | 4.349  | 39934    | 1.596 | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.578f | 55348    | 1.020 | ppm   |
| 13) n-Butane       | 6.578f | 55348    | 1.020 | ppm   |
| -----              |        |          |       |       |

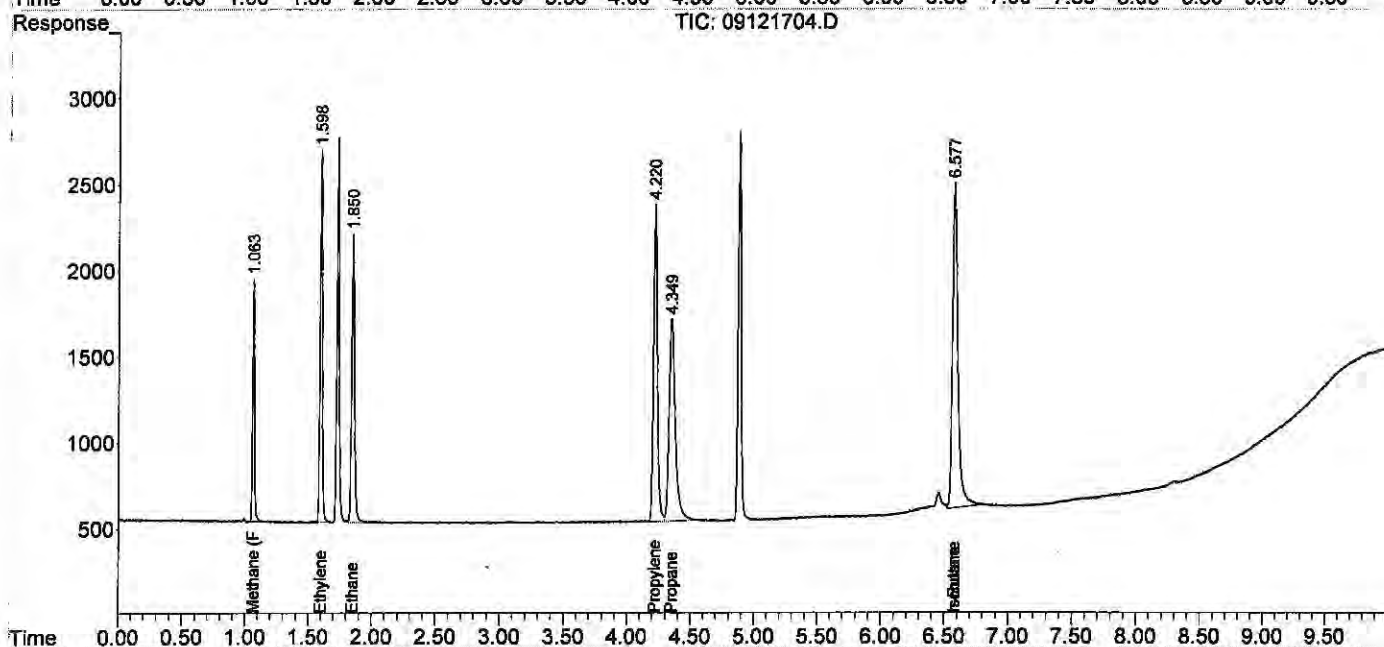
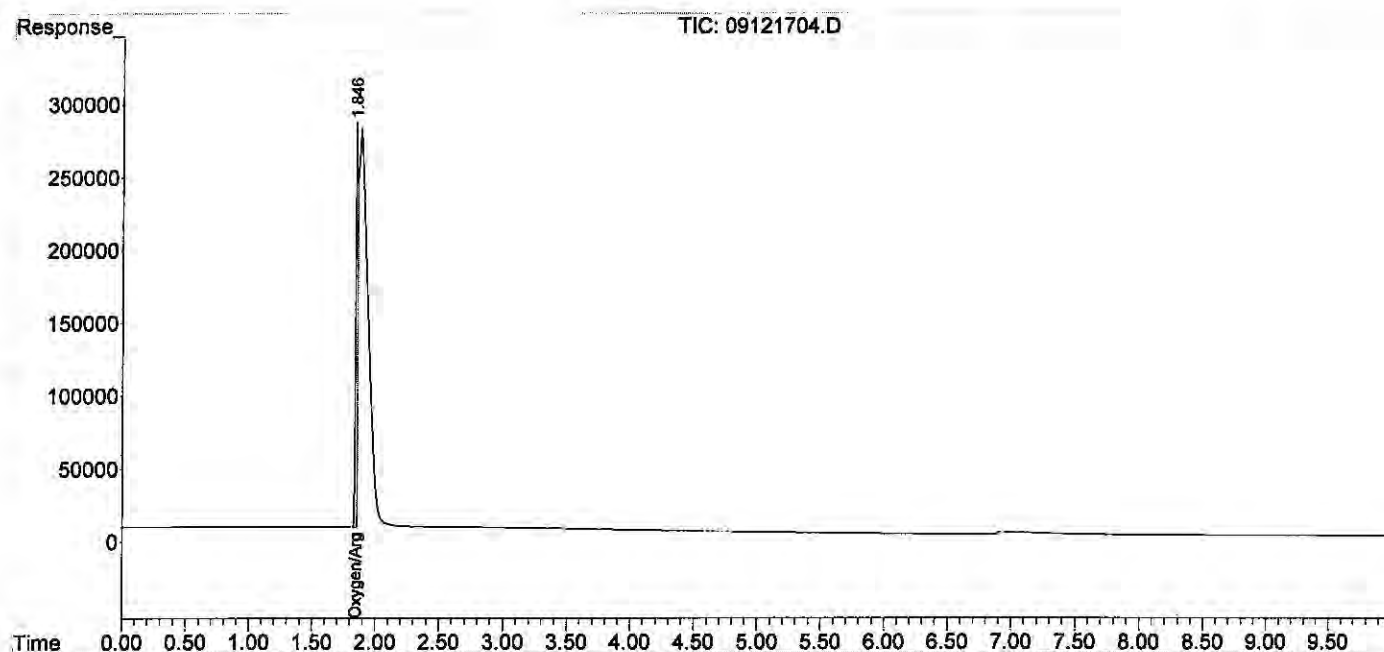
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121704.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 11:45  
Operator : MC  
Sample : 1.51ppm 0.1ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:05:55 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121705.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:09  
Operator : MC  
Sample : 4.53ppm 0.3ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:06:32 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc  | Units |
|--------------------|--------|----------|-------|-------|
| -----              |        |          |       |       |
| Target Compounds   |        |          |       |       |
| 1) Oxygen/Argon    | 1.738  | -331216  | N.D.  | ppm   |
| 2) Carbon monoxide | 1.738  | -331216  | 0.019 | ppm   |
| 3) Methane (TCD)   | 0.000  | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.052  | 41129    | 4.522 | ppm   |
| 7) Ethylene        | 1.586  | 77903    | 4.637 | ppm   |
| 8) Ethane          | 1.838  | 78354    | 4.558 | ppm   |
| 9) Propylene       | 4.218  | 112342   | 4.614 | ppm   |
| 10) Propane        | 4.347  | 115723   | 4.680 | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.580f | 155256   | 3.565 | ppm   |
| 13) n-Butane       | 6.580f | 155256   | 3.565 | ppm   |
| -----              |        |          |       |       |

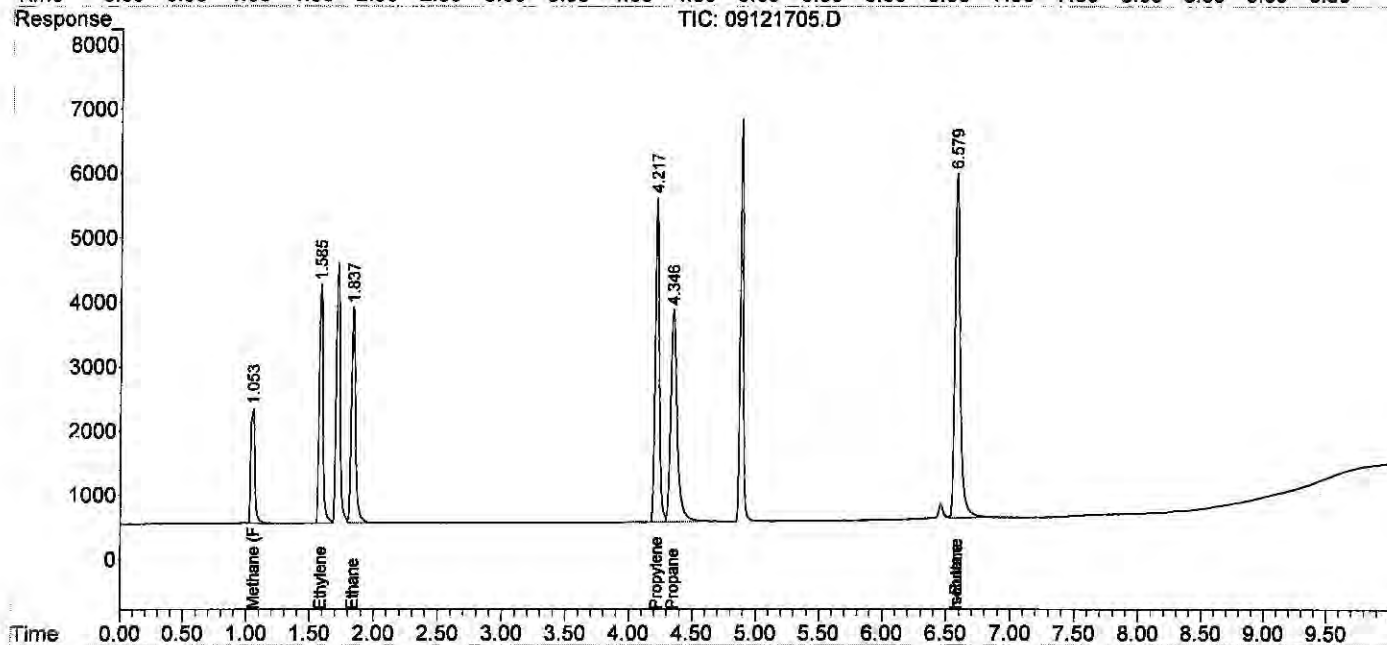
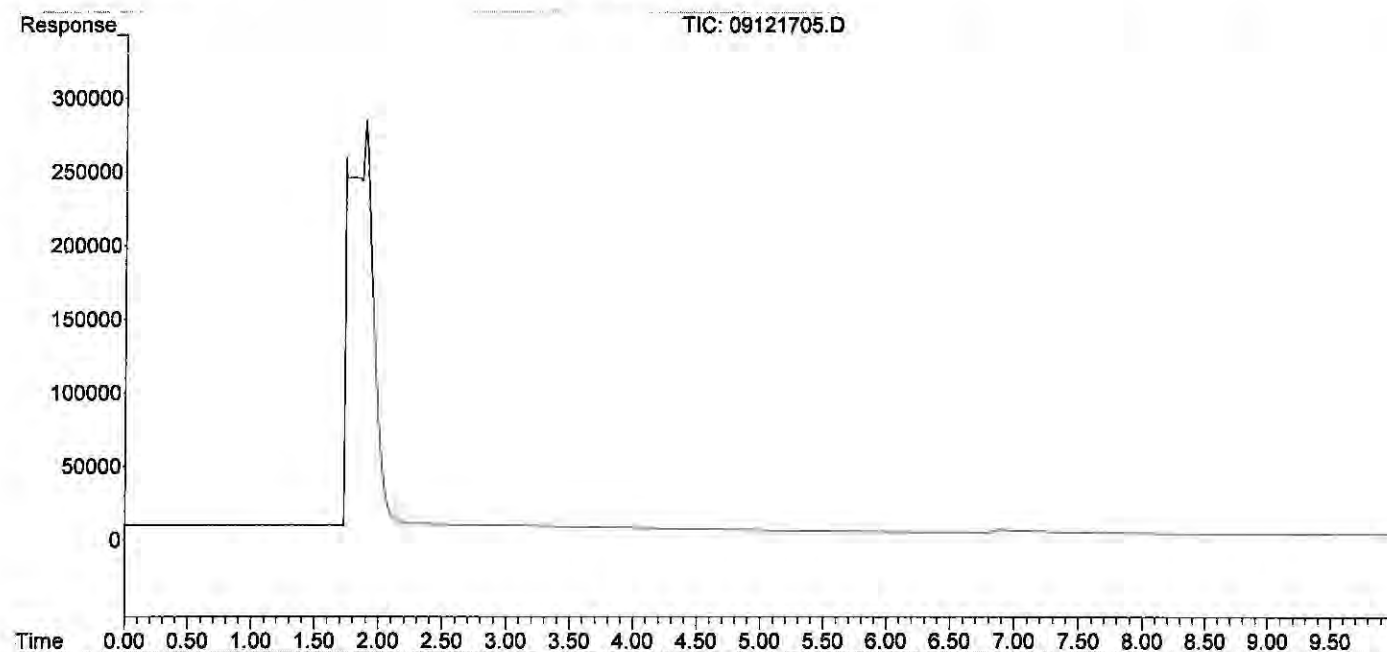
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121705.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:09  
Operator : MC  
Sample : 4.53ppm 0.3ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:06:32 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121706.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:30  
Operator : MC  
Sample : 10.57ppm 0.7ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:09:24 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response  | Conc   | Units |
|--------------------|--------|-----------|--------|-------|
| -----              |        |           |        |       |
| Target Compounds   |        |           |        |       |
| 1) Oxygen/Argon    | 1.929f | -31871242 | N.D.   | ppm   |
| 2) Carbon monoxide | 1.929f | -31871242 | 1.818  | ppm   |
| 3) Methane (TCD)   | 0.000  | 0         | N.D.   | ppm   |
| 4) Carbon dioxide  | 0.000  | 0         | N.D.   | ppm   |
| 6) Methane (FID)   | 1.025  | 91967     | 10.135 | ppm   |
| 7) Ethylene        | 1.568  | 172086    | 10.273 | ppm   |
| 8) Ethane          | 1.822  | 178841    | 10.441 | ppm   |
| 9) Propylene       | 4.214  | 248004    | 10.236 | ppm   |
| 10) Propane        | 4.344  | 257124    | 10.458 | ppm   |
| 11) Isobutylene    | 0.000  | 0         | N.D.   | ppm   |
| 12) Isobutane      | 6.578f | 338181    | 9.254  | ppm   |
| 13) n-Butane       | 6.578f | 338181    | 9.254  | ppm   |
| -----              |        |           |        |       |

(f)=RT Delta > 1/2 Window

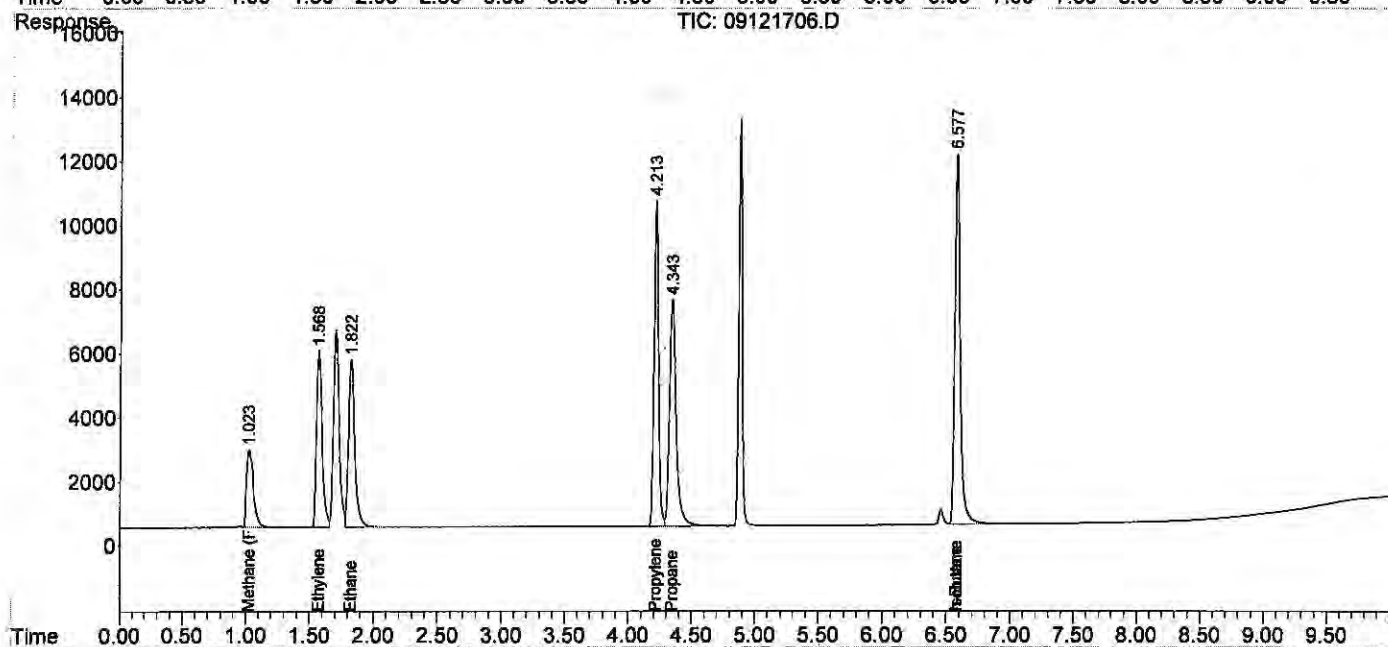
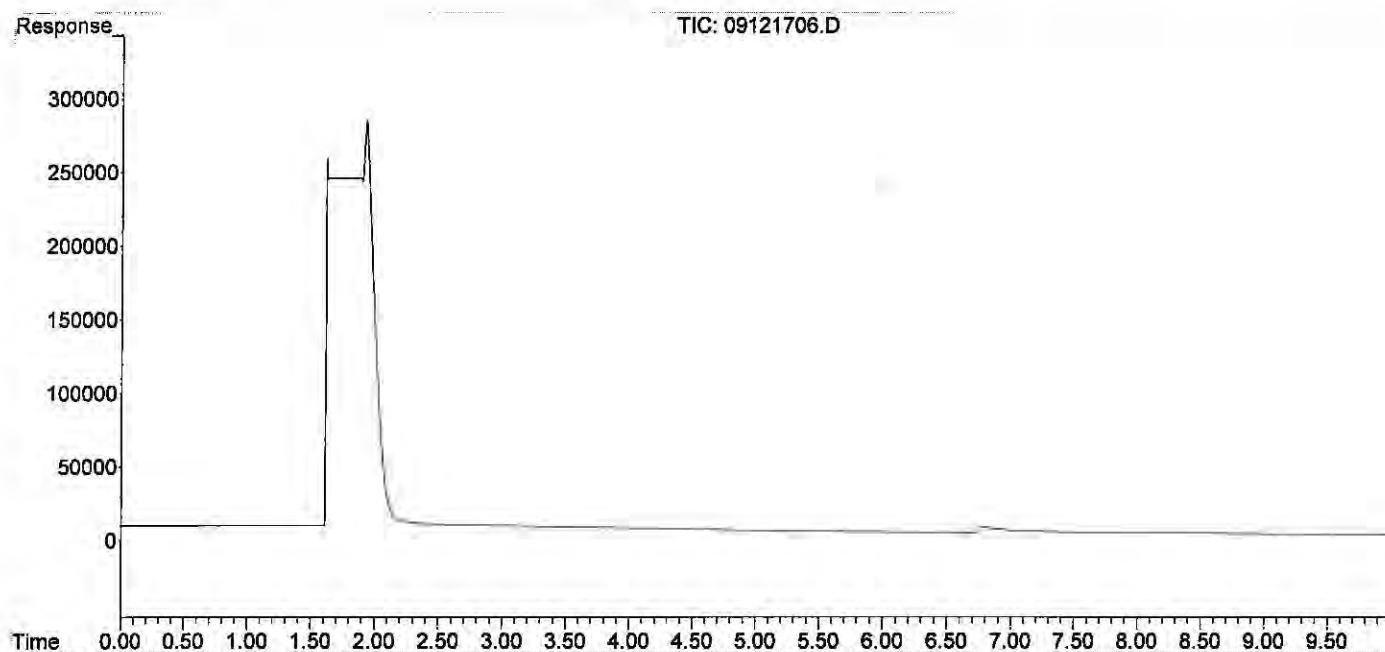
(m)=manual int.



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121706.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:30  
Operator : MC  
Sample : 10.57ppm 0.7ml s32-09051701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:09:24 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121707.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:47  
Operator : MC  
Sample : 200ppm 0.1ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:09:59 2017  
Quant Method : J:\GC10\METHODS\RS091217 R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc     | Units |
|--------------------|--------|----------|----------|-------|
| -----              |        |          |          |       |
| Target Compounds   |        |          |          |       |
| 1) Oxygen/Argon    | 1.897  | 155286   | 0.065    | ppm   |
| 2) Carbon monoxide | 1.897  | 155286   | N.D.     | ppm   |
| 3) Methane (TCD)   | 4.079f | 27015    | 2856.472 | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.     | ppm   |
| 6) Methane (FID)   | 1.063  | 1735997  | 190.792  | ppm   |
| 7) Ethylene        | 1.597  | 3339702  | 198.758  | ppm   |
| 8) Ethane          | 1.849  | 3350442  | 194.597  | ppm   |
| 9) Propylene       | 4.201  | 4504060  | 185.706  | ppm   |
| 10) Propane        | 4.333  | 5043036  | 204.809  | ppm   |
| 11) Isobutylene    | 0.000  | 0        | N.D.     | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.     | ppm   |

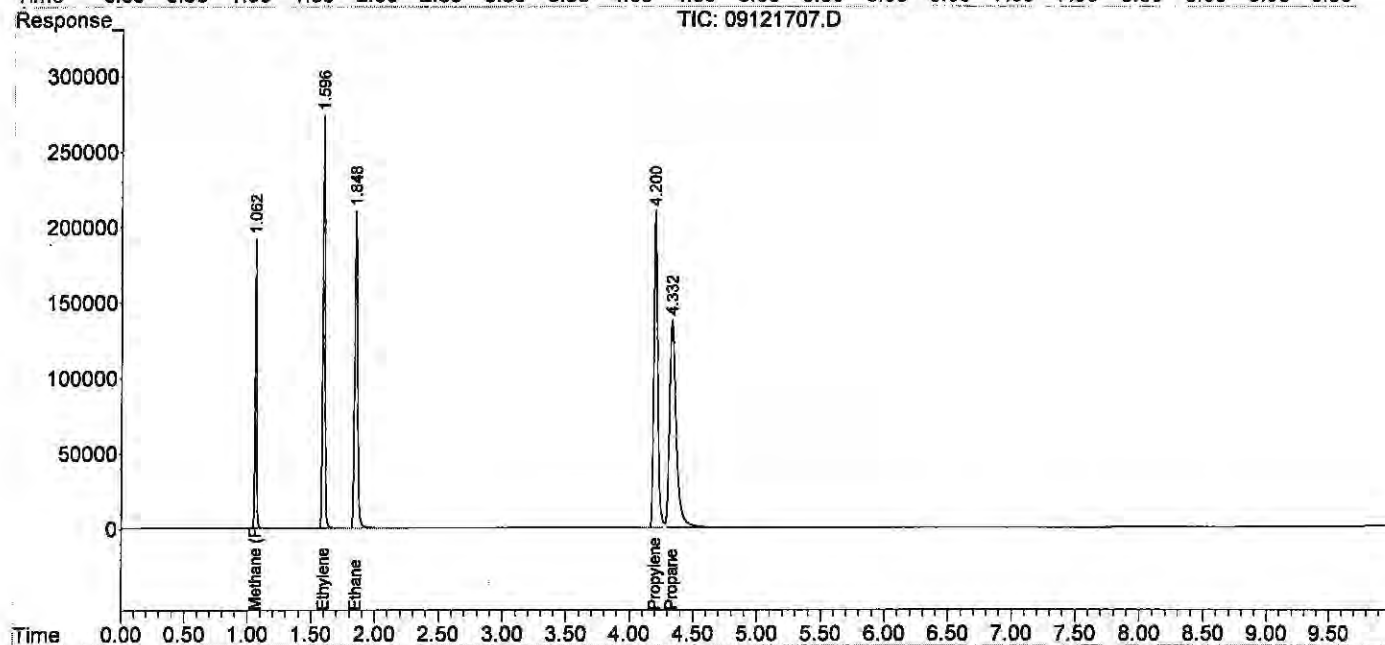
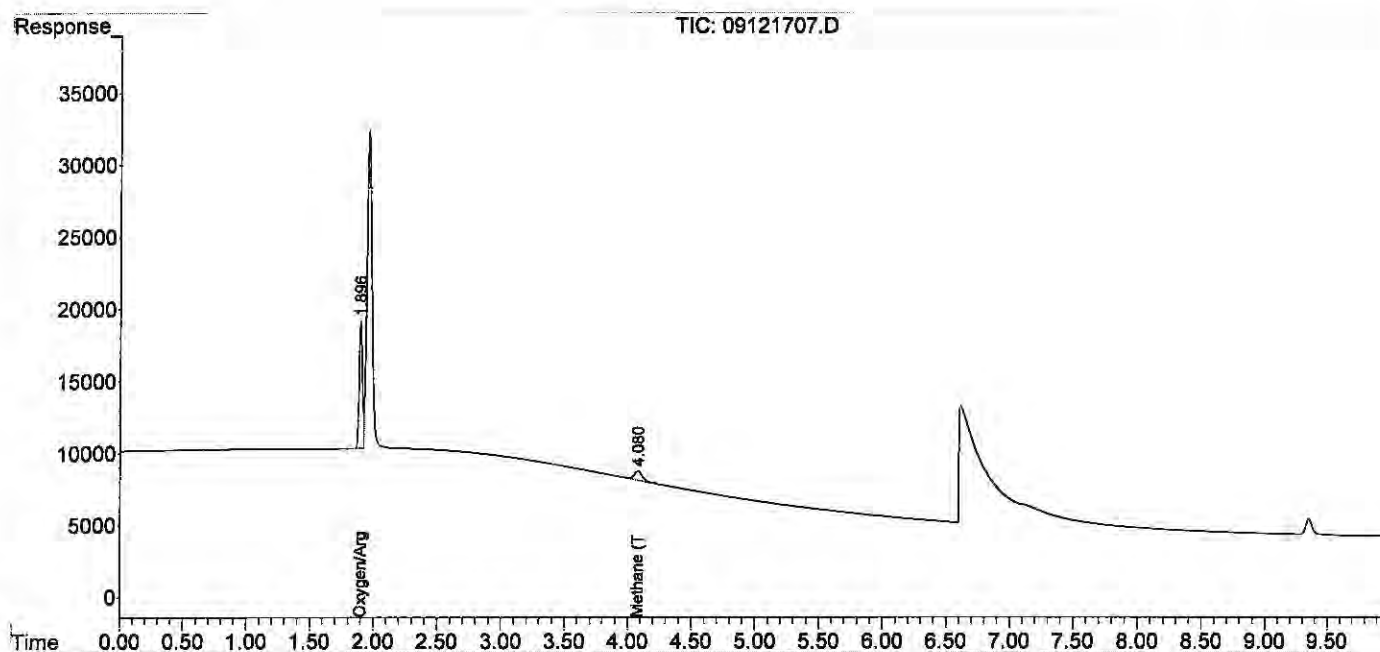
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121707.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 12:47  
Operator : MC  
Sample : 200ppm 0.1ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:09:59 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:04:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121708.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 13:00  
Operator : MC  
Sample : 600ppm 0.3ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:10:57 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:10:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units  |
|--------------------|--------|----------|-------------|
| -----              |        |          |             |
| Target Compounds   |        |          |             |
| 1) Oxygen/Argon    | 1.884  | 196022   | 0.124 ppm   |
| 2) Carbon monoxide | 1.884  | 196022   | N.D. ppm    |
| 3) Methane (TCD)   | 4.070f | 88282    | 782.730 ppm |
| 4) Carbon dioxide  | 0.000  | 0        | N.D. ppm    |
| 6) Methane (FID)   | 1.044  | 5189849  | 539.759 ppm |
| 7) Ethylene        | 1.573  | 10007759 | 590.286 ppm |
| 8) Ethane          | 1.822  | 10048964 | 583.213 ppm |
| 9) Propylene       | 4.160  | 13569343 | 562.612 ppm |
| 10) Propane        | 4.300  | 15251326 | 615.171 ppm |
| 11) Isobutylene    | 6.143  | 9815     | NoCal ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D. ppm    |
| 13) n-Butane       | 0.000  | 0        | N.D. ppm    |

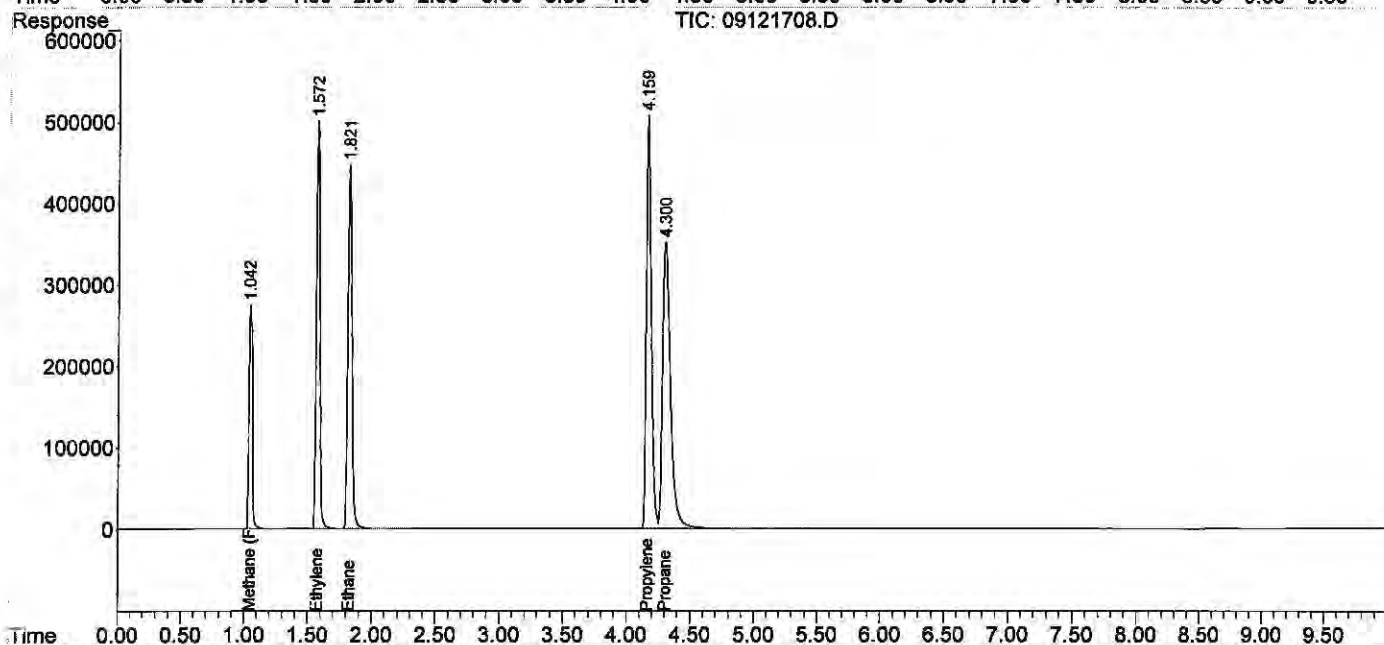
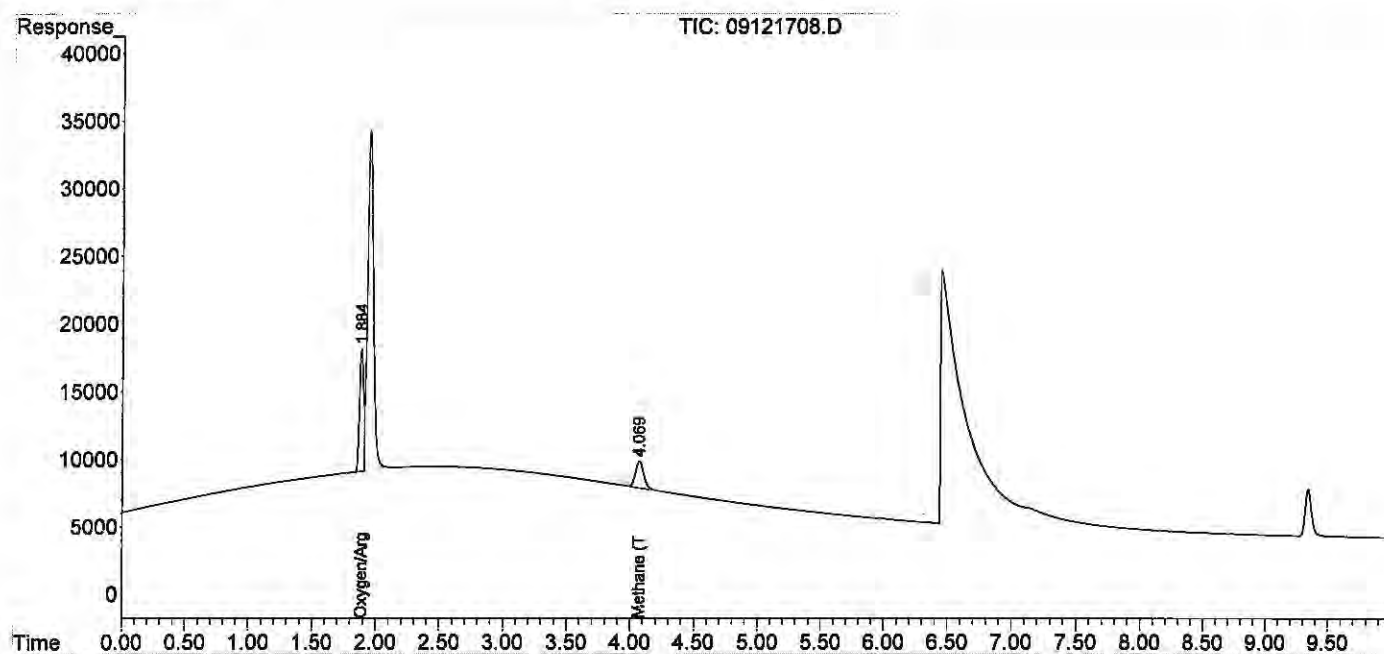
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121708.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 13:00  
Operator : MC  
Sample : 600ppm 0.3ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:10:57 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:10:50 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121709.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 13:47  
Operator : MC  
Sample : 1000ppm 0.5ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:11:46 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:11:38 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc     | Units |
|--------------------|--------|----------|----------|-------|
| -----              |        |          |          |       |
| Target Compounds   |        |          |          |       |
| 1) Oxygen/Argon    | 1.879  | 192611   | 0.162    | ppm   |
| 2) Carbon monoxide | 1.879  | 192611   | N.D.     | ppm   |
| 3) Methane (TCD)   | 4.070f | 145492   | 1244.729 | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.     | ppm   |
| 6) Methane (FID)   | 1.039  | 8598534  | 945.644  | ppm   |
| 7) Ethylene        | 1.576  | 16608504 | 981.887  | ppm   |
| 8) Ethane          | 1.827  | 16709165 | 973.644  | ppm   |
| 9) Propylene       | 4.161  | 22494888 | 941.060  | ppm   |
| 10) Propane        | 4.298  | 25459411 | 1023.223 | ppm   |
| 11) Isobutylene    | 6.138  | 16970    | 8645.243 | ppm   |
| 12) Isobutane      | 0.000  | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000  | 0        | N.D.     | ppm   |
| -----              |        |          |          |       |

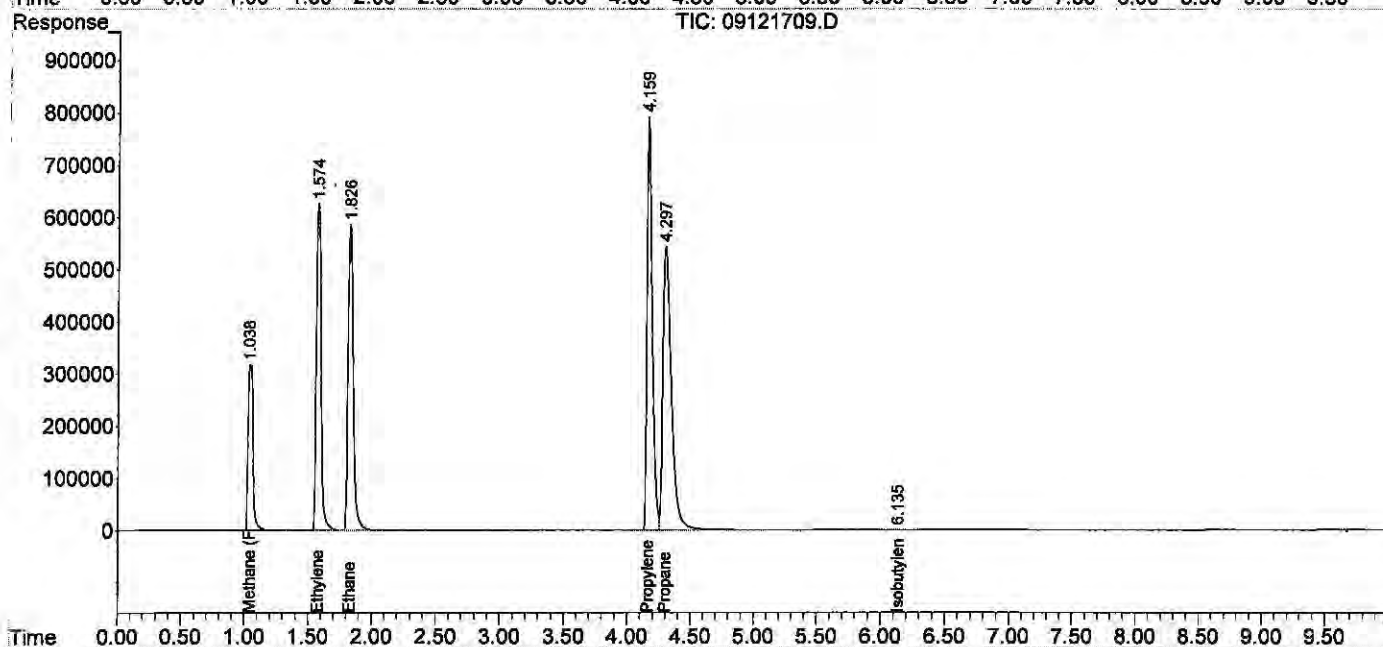
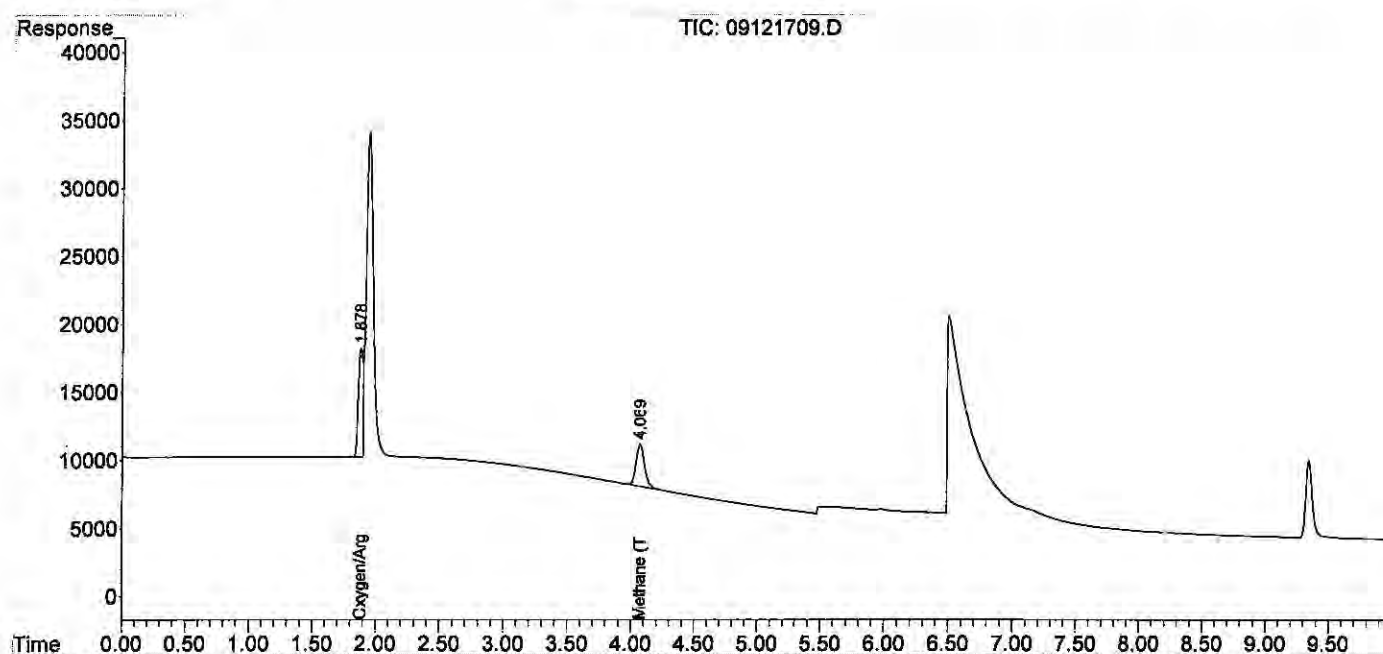
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121709.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 13:47  
Operator : MC  
Sample : 1000ppm 0.5ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:11:46 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:11:38 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
 Data File : 09121710.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 12-Sep-2017, 14:07  
 Operator : MC  
 Sample : 2000ppm 1ml s32-09121701  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Sep 13 11:12:33 2017  
 Quant Method : J:\GC10\METHODS\RS091217\_R.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
 QLast Update : Wed Sep 13 11:12:25 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc      | Units |
|--------------------|--------|----------|-----------|-------|
| -----              |        |          |           |       |
| Target Compounds   |        |          |           |       |
| 1) Oxygen/Argon    | 1.922f | 1578147  | 1.659     | ppm   |
| 2) Carbon monoxide | 1.922f | 1578147  | N.D.      | ppm   |
| 3) Methane (TCD)   | 4.057f | 281651   | 3526.607  | ppm   |
| 4) Carbon dioxide  | 0.000  | 0        | N.D.      | ppm   |
| 6) Methane (FID)   | 1.016  | 16098209 | 1763.622  | ppm   |
| 7) Ethylene        | 1.552  | 31192444 | 1848.268  | ppm   |
| 8) Ethane          | 1.801  | 31424218 | 1837.143  | ppm   |
| 9) Propylene       | 4.129  | 42124690 | 1775.341  | ppm m |
| 10) Propane        | 4.269  | 48583085 | 1946.921  | ppm   |
| 11) Isobutylene    | 6.136  | 33832    | 25613.603 | ppm   |
| 12) Isobutane      | 6.576f | 3845     | 0.120     | ppm   |
| 13) n-Butane       | 6.576f | 3845     | 0.120     | ppm   |
| -----              |        |          |           |       |

(f)=RT Delta > 1/2 Window

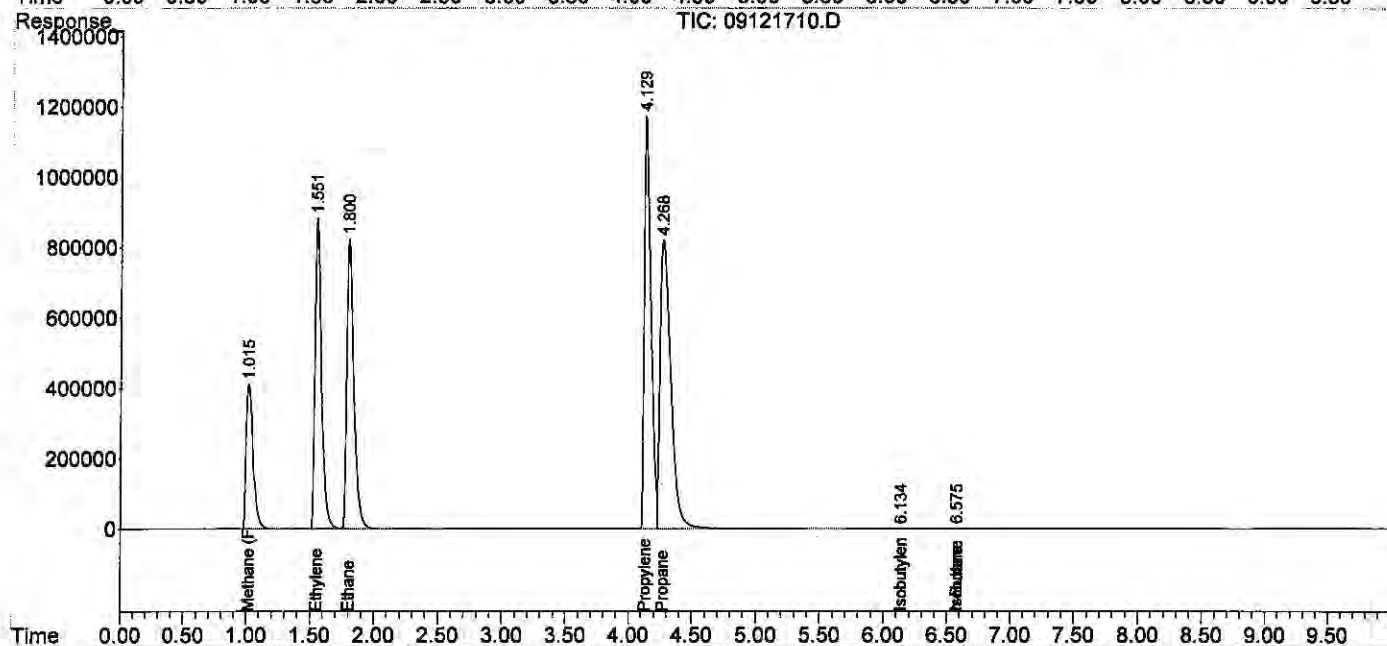
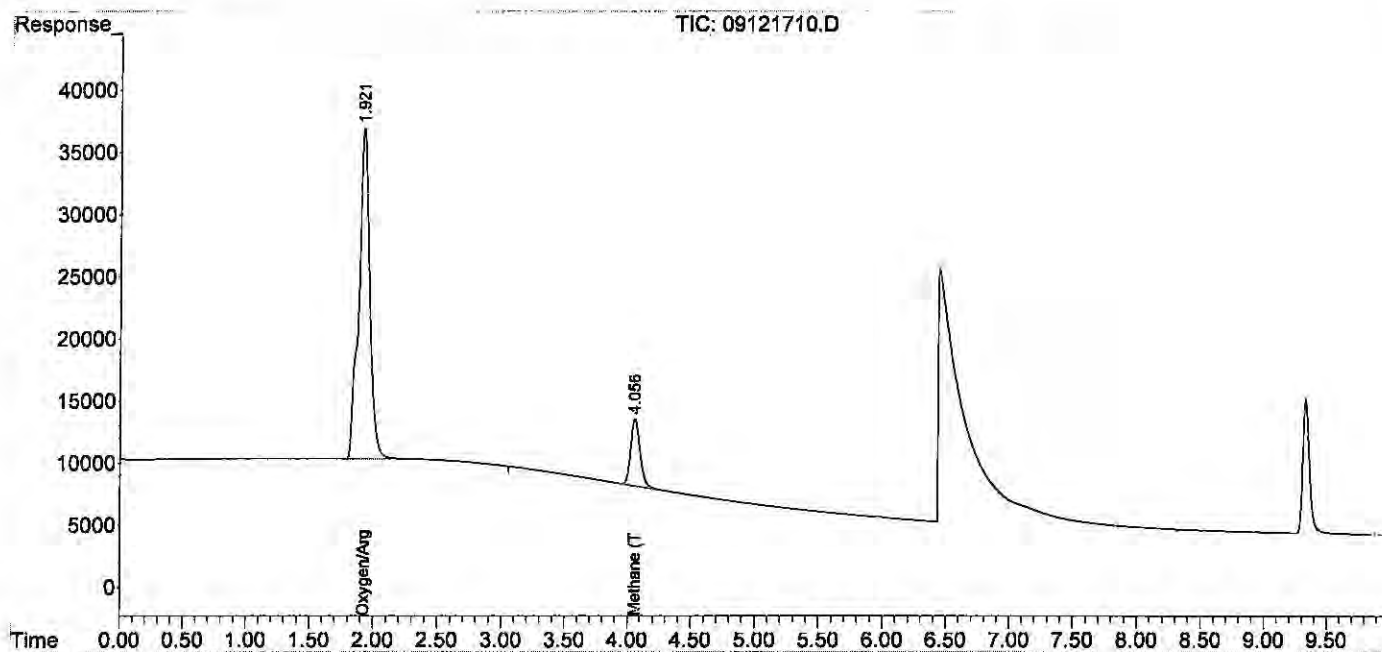
(m)=manual int.



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121710.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 14:07  
Operator : MC  
Sample : 2000ppm 1ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:12:33 2017  
Quant Method : J:\GC10\METHODS\RS091217 R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:12:25 2017  
Response via : Initial Calibration  
Integrator: ChemStation

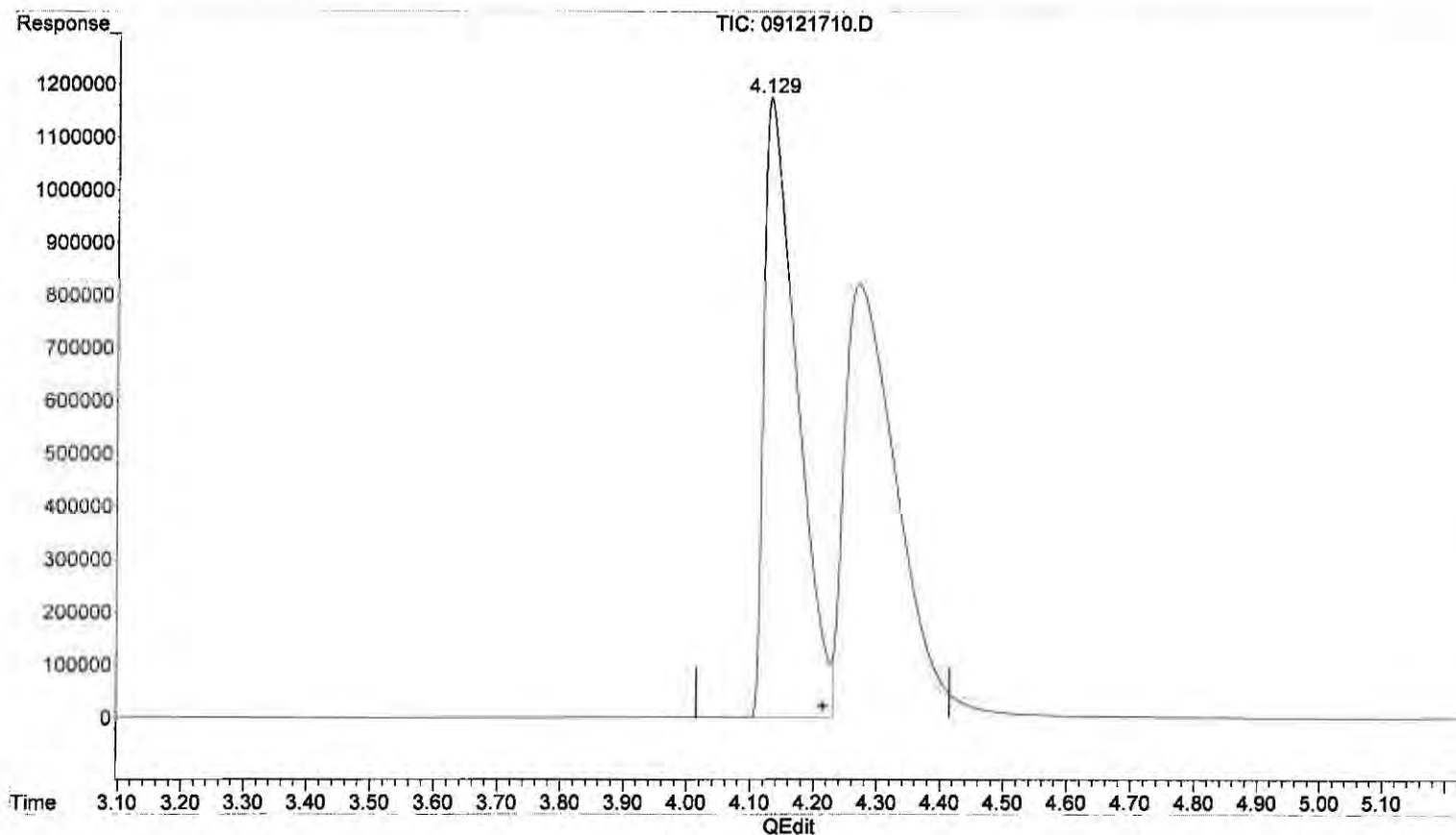
Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121710.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 14:07  
Operator : MC  
Sample : 2000ppm 1ml s32-09121701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:12:33 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:12:25 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



(9) Propylene

4.129min 1775.341 ppm m

response 42124690

M<sub>2</sub> 4/13/17  
w/p

M<sub>6</sub>  
P<sub>1</sub>

6/9/21/17

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121711.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 14:48  
Operator : MC  
Sample : 4000ppm 0.1ml s32-08231701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:13:37 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:13:29 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc     | Units |
|--------------------|-------|----------|----------|-------|
| Target Compounds   |       |          |          |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.     | ppm d |
| 2) Carbon monoxide | 0.000 | 0        | N.D.     | ppm d |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.     | ppm d |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.     | ppm d |
| 6) Methane (FID)   | 1.059 | 35776839 | 3925.122 | ppm   |
| 7) Ethylene        | 0.000 | 0        | N.D.     | ppm   |
| 8) Ethane          | 0.000 | 0        | N.D.     | ppm   |
| 9) Propylene       | 0.000 | 0        | N.D.     | ppm   |
| 10) Propane        | 0.000 | 0        | N.D.     | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.     | ppm   |
| 12) Isobutane      | 0.000 | 0        | N.D.     | ppm   |
| 13) n-Butane       | 0.000 | 0        | N.D.     | ppm   |

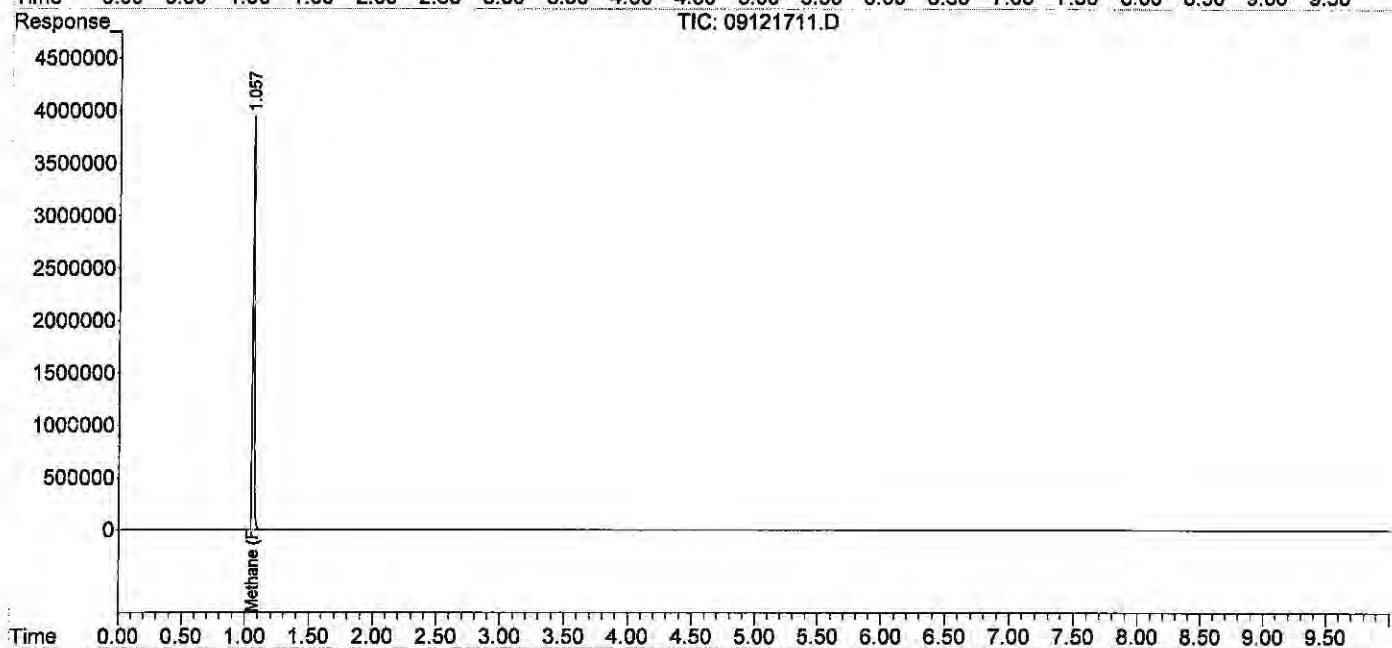
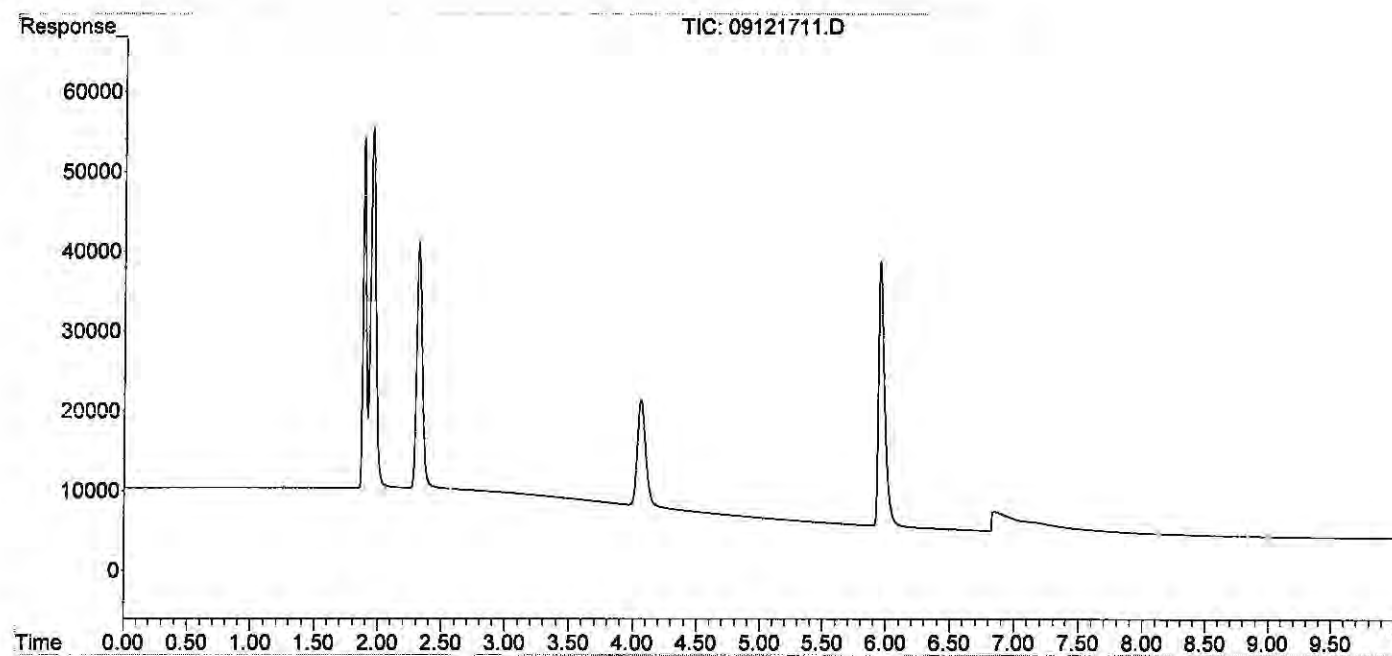
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121711.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 14:48  
Operator : MC  
Sample : 4000ppm 0.1ml s32-08231701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:13:37 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:13:29 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
 Data File : 09121712.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 12-Sep-2017, 15:21  
 Operator : MC  
 Sample : 20000ppm 0.5ml s32-08231701  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Sep 13 11:14:17 2017  
 Quant Method : J:\GC10\METHODS\RS091217\_R.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
 QLast Update : Wed Sep 13 11:13:29 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response  | Conc      | Units |
|--------------------|-------|-----------|-----------|-------|
| -----              |       |           |           |       |
| Target Compounds   |       |           |           |       |
| 1) Oxygen/Argon    | 0.000 | 0         | N.D.      | ppm d |
| 2) Carbon monoxide | 1.836 | 3190788   | N.D.      | ppm   |
| 3) Methane (TCD)   | 0.000 | 0         | N.D.      | ppm d |
| 4) Carbon dioxide  | 0.000 | 0         | N.D.      | ppm d |
| 6) Methane (FID)   | 1.034 | 169009160 | 18492.064 | ppm   |
| 7) Ethylene        | 0.000 | 0         | N.D.      | ppm   |
| 8) Ethane          | 0.000 | 0         | N.D.      | ppm   |
| 9) Propylene       | 0.000 | 0         | N.D.      | ppm   |
| 10) Propane        | 0.000 | 0         | N.D.      | ppm   |
| 11) Isobutylene    | 0.000 | 0         | N.D.      | ppm   |
| 12) Isobutane      | 0.000 | 0         | N.D.      | ppm   |
| 13) n-Butane       | 0.000 | 0         | N.D.      | ppm   |
| -----              |       |           |           |       |

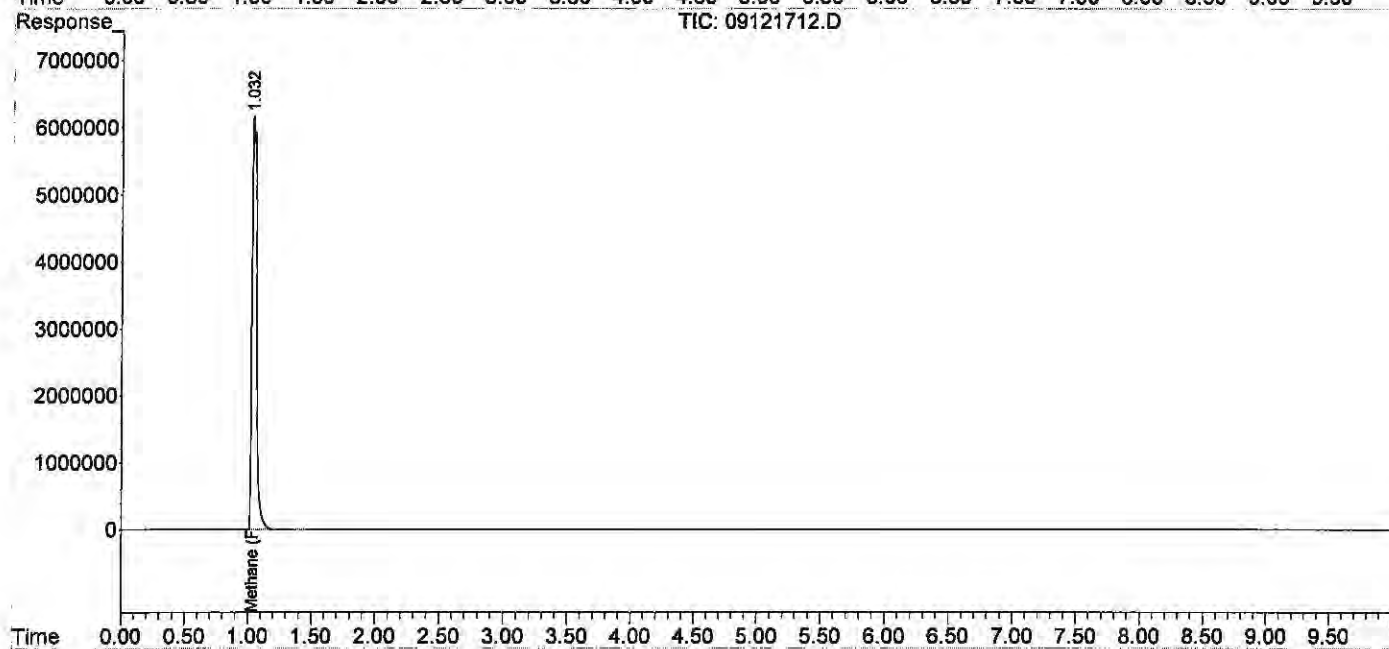
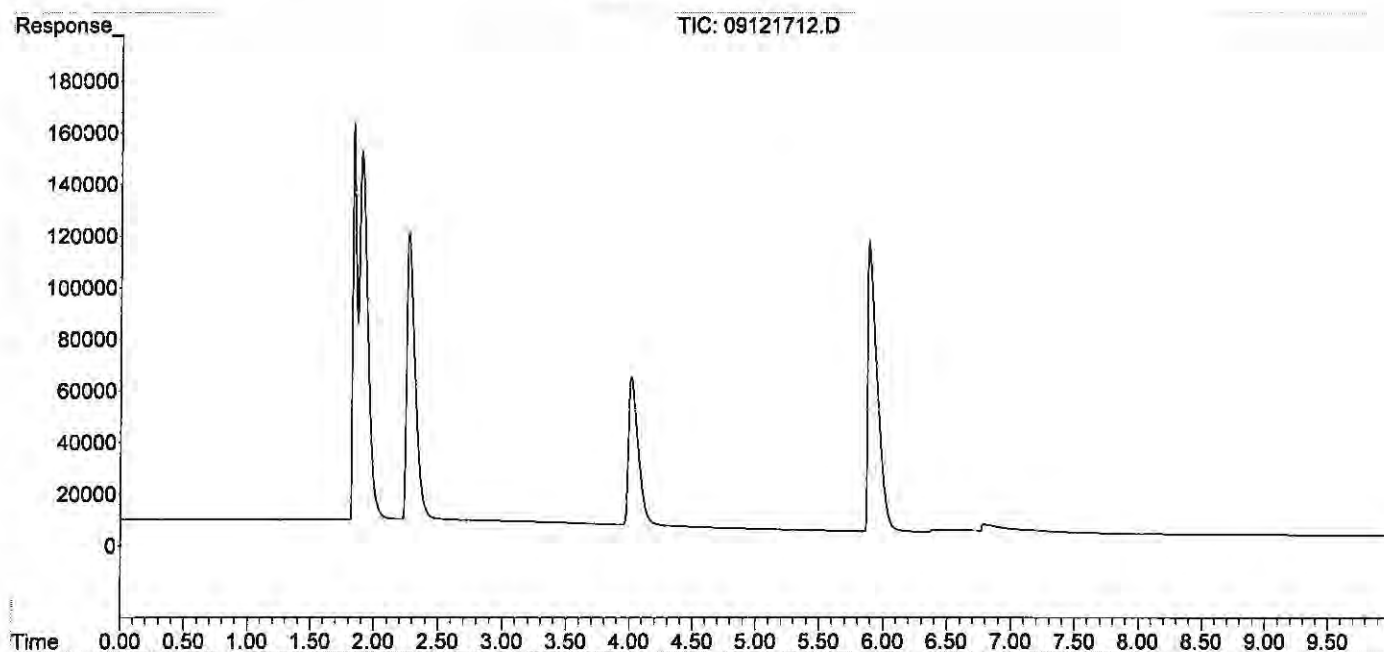
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121712.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 15:21  
Operator : MC  
Sample : 20000ppm 0.5ml s32-08231701  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:14:17 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:13:29 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :





Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
 Data File : 09121715.D  
 Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
 Acq On : 12-Sep-2017, 16:15  
 Operator : MC  
 Sample : icv s30-05241604  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
 Integration File signal 2: autoint2.e  
 Quant Time: Sep 13 11:15:11 2017  
 Quant Method : J:\GC10\METHODS\RS091217\_R.M  
 Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
 QLast Update : Wed Sep 13 11:13:29 2017  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. :  
 Signal #1 Phase : Signal #2 Phase:  
 Signal #1 Info : Signal #2 Info :

| Compound           | R.T.   | Response | Conc Units                       |
|--------------------|--------|----------|----------------------------------|
| -----              |        |          |                                  |
| Target Compounds   |        |          |                                  |
| 1) Oxygen/Argon    | 1.843  | 2922459  | 3.687 ppm                        |
| 2) Carbon monoxide | 1.843  | 2922459  | N.D. ppm                         |
| 3) Methane (TCD)   | 0.000  | 0        | N.D. ppm <i>actual 2/1</i>       |
| 4) Carbon dioxide  | 0.000  | 0        | N.D. ppm                         |
| 6) Methane (FID)   | 1.063  | 13748    | 1.516 ppm <i>1570 1.50 101.1</i> |
| 7) Ethylene        | 1.598  | 24153    | 1.443 ppm <i>1570 1.50 96.2</i>  |
| 8) Ethane          | 1.850  | 24488    | 1.445 ppm <i>1570 1.50 96.3</i>  |
| 9) Propylene       | 4.221  | 36004    | 1.537 ppm <i>1570 1.50 102.5</i> |
| 10) Propane        | 4.350  | 37738    | 1.517 ppm <i>1570 1.50 100.5</i> |
| 11) Isobutylene    | 0.000  | 0        | N.D. ppm                         |
| 12) Isobutane      | 6.579f | 48019    | 1.804 ppm <i>9/11/12</i>         |
| 13) n-Butane       | 6.579f | 48019    | 1.804 ppm                        |
| -----              |        |          |                                  |

(f)=RT Delta > 1/2 Window

(m)=manual int.

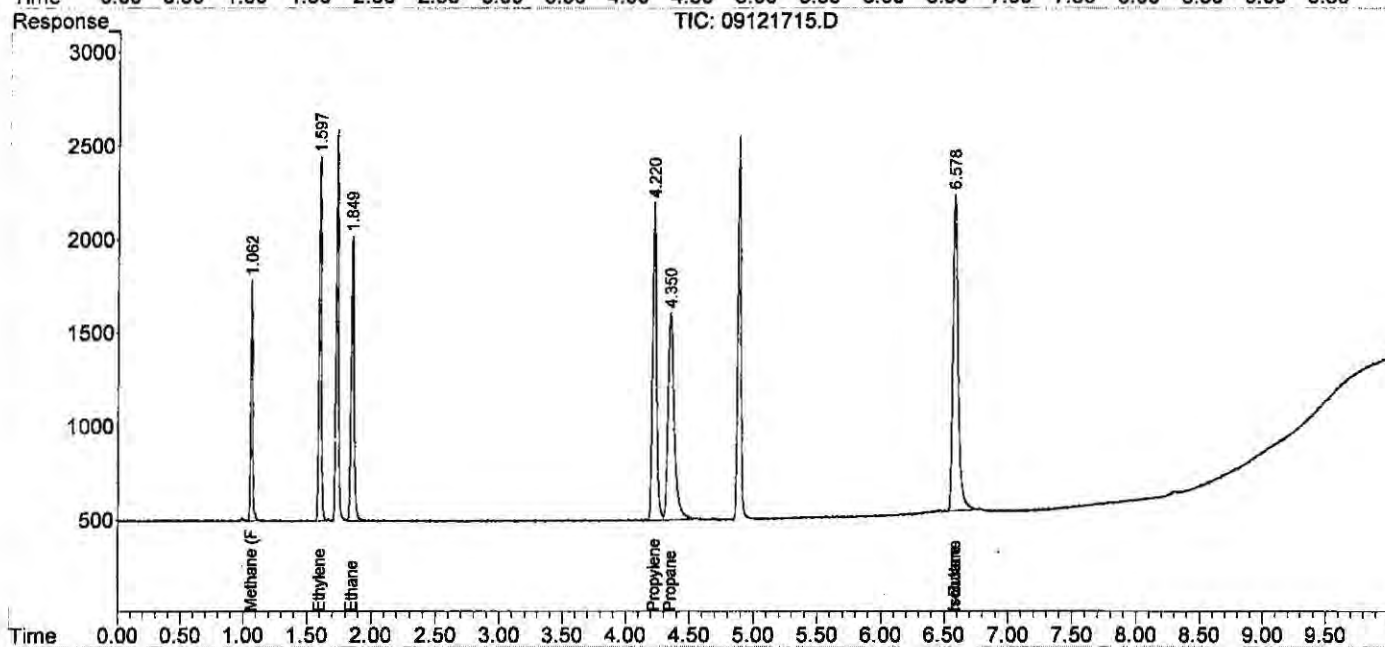
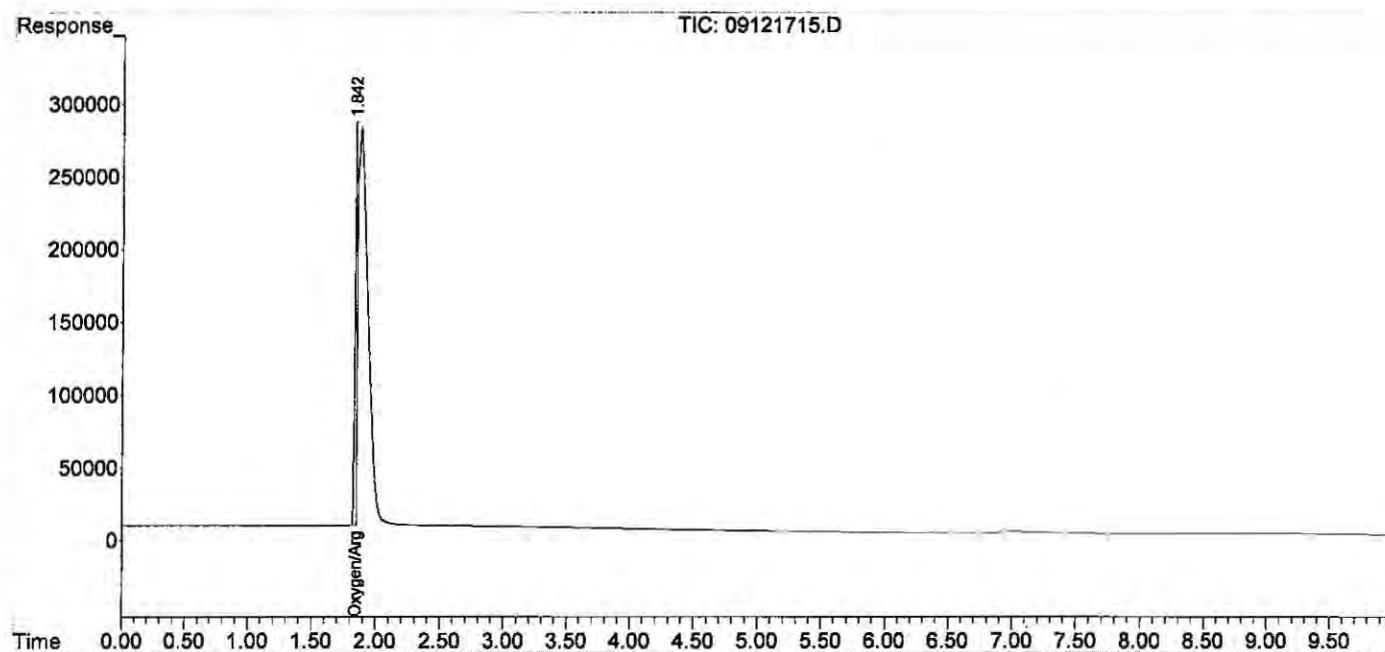
*W. Q. 12/17*



Data Path : J:\GC10\DATA\RSK\_FID\2017\_09\12\  
Data File : 09121715.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 12-Sep-2017, 16:15  
Operator : MC  
Sample : icv s30-05241604  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: Sep 13 11:15:11 2017  
Quant Method : J:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:13:29 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



ALS Environmental

Method : RSK175 Headspace Method for Dissolved Hydrocarbon in Water by FID/TC

Client : ALS Laboratory Group

Service Request: P1902518

Sample Vol. (ml) : 32.00 ml

Analyst : WH

Date Analysis : 05/07/19

Gas Constant : 24.05684 (20°C)

Instrument : GC#10

Detector : FID#10, TCD#10

HEAD SPACE RESULT (ppm)

FINAL HEAD SPACE RESULT (ppm)

| Sample ID          | Ini. Vol. | Methane | Ethylene | Ethane | Methane  | Ethylene | Ethane   |
|--------------------|-----------|---------|----------|--------|----------|----------|----------|
| std s32-07231801   | 0.100     | 1.511   | 1.468    | 1.437  | 16.04    | 28.05    | 30.07    |
| ACTUAL             |           | 1.51    | 1.51     | 1.51   | 3.76E+04 | 1.02E+04 | 2.63E+04 |
| %Difference        |           | 0.1%    | 2.8%     | 4.8%   | 1.30     | 1.00     | 0.60     |
| mcs 0.1ml          | 0.100     | 0.095   | 0.000    | 0.000  | 0.950    | 0.000    | 0.000    |
| rb 0.1ml           | 0.100     | 0.000   | 0.000    | 0.000  |          |          |          |
| fid lcs 0.1ml      | 0.100     | 1.422   | 0.993    | 1.221  | 14.220   | 9.930    | 12.210   |
| fid lcsd 0.1ml     | 0.100     | 1.418   | 1.022    | 1.269  | 14.180   | 10.220   | 12.690   |
| P1902518-001 0.1ml | 0.100     | 0.071   | 0.000    | 0.000  | 0.710    | 0.000    | 0.000    |
| P1902518-002 0.1ml | 0.100     | 0.066   | 0.000    | 0.000  | 0.660    | 0.000    | 0.000    |
| P1902518-003 0.1ml | 0.100     | 1.328   | 0.000    | 0.000  | 13.280   | 0.000    | 0.000    |

|                  |       |       |       |
|------------------|-------|-------|-------|
| std s32-07231801 | 1.670 | 1.615 | 1.589 |
| ACTUAL           | 1.51  | 1.51  | 1.51  |
| %Difference      | 10.6% | 7.0%  | 5.2%  |

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071901.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 11:16:44  
Operator : WH  
Sample : std s32-07231801  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 11:42:41 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.111 | 13706    | 1.511 | ppm   |
| 7) Ethylene        | 1.673 | 24571    | 1.468 | ppm   |
| 8) Ethane          | 1.935 | 24353    | 1.437 | ppm   |
| 9) Propylene       | 4.313 | 33703    | 1.438 | ppm   |
| 10) Propane        | 4.436 | 34957    | 1.405 | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.650 | 43683    | 1.641 | ppm   |
| 13) n-Butane       | 6.650 | 43683    | 1.641 | ppm   |
| -----              |       |          |       |       |

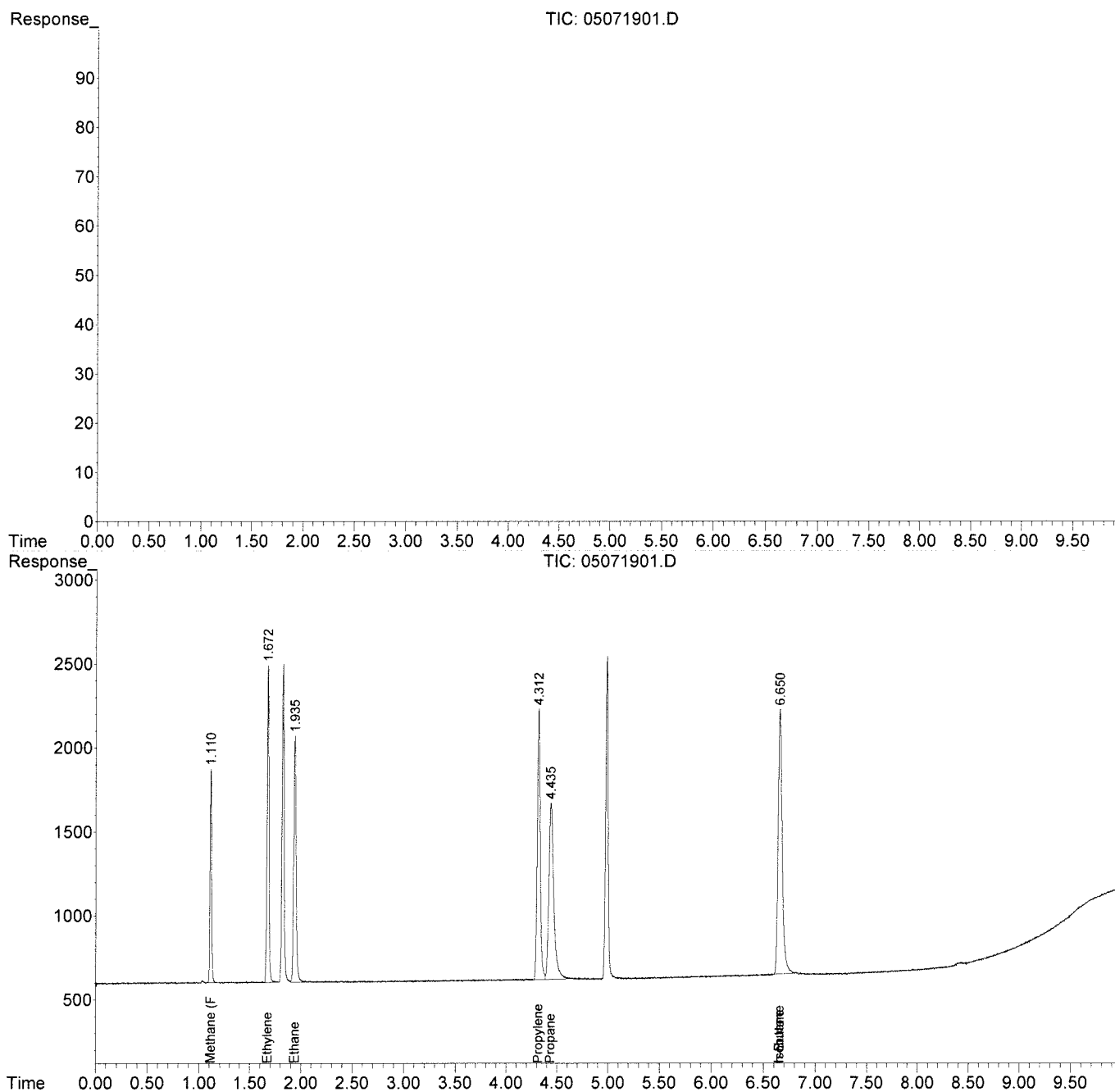
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071901.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 11:16:44  
Operator : WH  
Sample : std s32-07231801  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 11:42:41 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071914.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 16:10:13  
Operator : WH  
Sample : std s32-07231801  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 16:37:30 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-TO3C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Oxygen/Argon    | 0.000 | 0        | N.D.  | ppm   |
| 2) Carbon monoxide | 0.000 | 0        | N.D.  | ppm   |
| 3) Methane (TCD)   | 0.000 | 0        | N.D.  | ppm   |
| 4) Carbon dioxide  | 0.000 | 0        | N.D.  | ppm   |
| 6) Methane (FID)   | 1.083 | 15146    | 1.670 | ppm   |
| 7) Ethylene        | 1.646 | 27029    | 1.615 | ppm   |
| 8) Ethane          | 1.909 | 26933    | 1.589 | ppm   |
| 9) Propylene       | 4.306 | 37901    | 1.618 | ppm   |
| 10) Propane        | 4.431 | 39325    | 1.581 | ppm   |
| 11) Isobutylene    | 0.000 | 0        | N.D.  | ppm   |
| 12) Isobutane      | 6.651 | 50413    | 1.894 | ppm   |
| 13) n-Butane       | 6.651 | 50413    | 1.894 | ppm   |
| -----              |       |          |       |       |

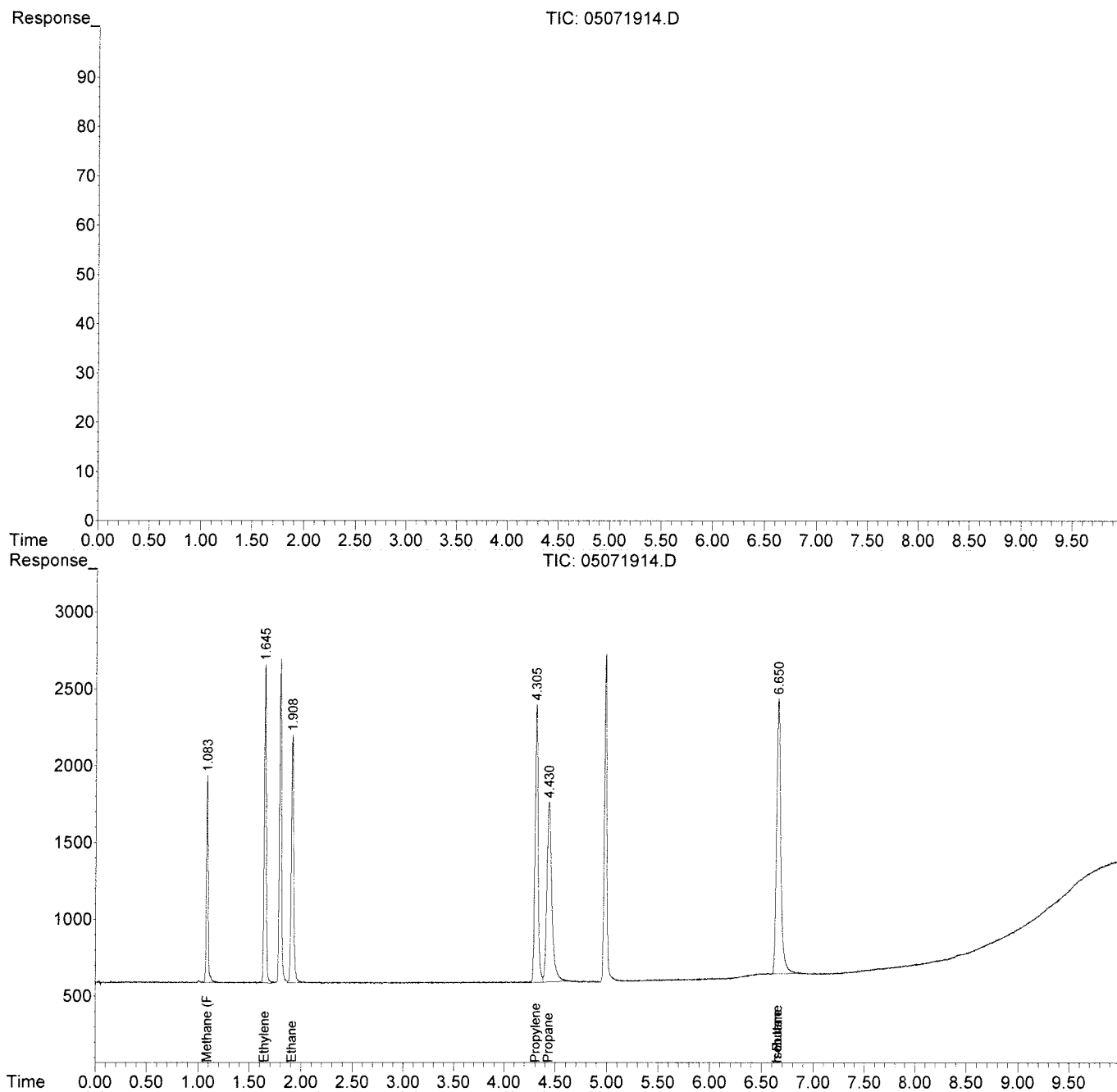
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC10\DATA\RSK\_FID\2019\_05\07\  
Data File : 05071914.D  
Signal(s) : Signal #1: TCD1A.CH Signal #2: FID2B.CH  
Acq On : 07-May-2019, 16:10:13  
Operator : WH  
Sample : std s32-07231801  
Misc :  
ALS Vial : 1 Sample Multiplier: 1

Integration File signal 1: autoint1.e  
Integration File signal 2: autoint2.e  
Quant Time: May 07 16:37:30 2019  
Quant Method : I:\GC10\METHODS\RS091217\_R.M  
Quant Title : RSK175, VOA-DISGAS, VOA-T03C1C6  
QLast Update : Wed Sep 13 11:14:47 2017  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. :  
Signal #1 Phase : Signal #2 Phase:  
Signal #1 Info : Signal #2 Info :



[illegible]



[illegible]



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ALS Environmental  
ALS Group USA, Corp  
1317 South 13th Avenue  
Kelso, WA 98626  
T : 1 360 577 7222  
F : 1 360 636 1068  
[www.alsglobal.com](http://www.alsglobal.com)

May 13, 2019

**Analytical Report for Service Request No: K1903966**

RJ Modashia  
ALS Laboratory Group  
10450 Stancliff Road  
Suite 210  
Houston, TX 77099-4338

**RE: HS19050082**

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory May 03, 2019  
For your reference, these analyses have been assigned our service request number **K1903966**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3350. You may also contact me via email at [Kelley.Lovejoy@alsglobal.com](mailto:Kelley.Lovejoy@alsglobal.com).

Respectfully submitted,

**ALS Group USA, Corp. dba ALS Environmental**

for Kelley Lovejoy  
Project Manager



---

ALS Environmental  
ALS Group USA, Corp  
1317 South 13th Avenue  
Kelso, WA 98626  
T : 1 360 577 7222  
F : 1 360 636 1068  
[www.alsglobal.com](http://www.alsglobal.com)

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## Acronyms

|            |  |
|------------|--|
| ASTM       | American Society for Testing and Materials   |
| A2LA       | American Association for Laboratory Accreditation  |
| CARB       | California Air Resources Board   |
| CAS Number | Chemical Abstract Service registry Number  |
| CFC        | Chlorofluorocarbon   |
| CFU        | Colony-Forming Unit  |
| DEC        | Department of Environmental Conservation   |
| DEQ        | Department of Environmental Quality  |
| DHS        | Department of Health Services  |
| DOE        | Department of Ecology  |
| DOH        | Department of Health   |
| EPA        | U. S. Environmental Protection Agency  |
| ELAP       | Environmental Laboratory Accreditation Program   |
| GC         | Gas Chromatography   |
| GC/MS      | Gas Chromatography/Mass Spectrometry   |
| LOD        | Limit of Detection   |
| LOQ        | Limit of Quantitation  |
| LUFT       | Leaking Underground Fuel Tank  |
| M          | Modified   |
| MCL        | Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA. |
| MDL        | Method Detection Limit   |
| MPN        | Most Probable Number   |
| MRL        | Method Reporting Limit   |
| NA         | Not Applicable   |
| NC         | Not Calculated   |
| NCASI      | National Council of the Paper Industry for Air and Stream Improvement  |
| ND         | Not Detected   |
| NIOSH      | National Institute for Occupational Safety and Health  |
| PQL        | Practical Quantitation Limit   |
| RCRA       | Resource Conservation and Recovery Act   |
| SIM        | Selected Ion Monitoring  |
| TPH        | Total Petroleum Hydrocarbons   |
| tr         | Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.                           |

### Inorganic Data Qualifiers

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

### Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

### Organic Data Qualifiers

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

### Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

**ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso**  
**State Certifications, Accreditations, and Licenses**

| <b>Agency</b>            | <b>Web Site</b>   | <b>Number</b> |
|--------------------------|---|---------------|
| Alaska DEH               | <a href="http://dec.alaska.gov/eh/lab/cs/csapproval.htm">http://dec.alaska.gov/eh/lab/cs/csapproval.htm</a>   | UST-040       |
| Arizona DHS              | <a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>   | AZ0339        |
| Arkansas - DEQ           | <a href="http://www.adeq.state.ar.us/techsvs/labcert.htm">http://www.adeq.state.ar.us/techsvs/labcert.htm</a>   | 88-0637       |
| California DHS (ELAP)    | <a href="http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx">http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx</a>   | 2795          |
| DOD ELAP                 | <a href="http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm">http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm</a>   | L16-58-R4     |
| Florida DOH              | <a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>   | E87412        |
| Hawaii DOH               | <a href="http://health.hawaii.gov/">http://health.hawaii.gov/</a>   | -             |
| ISO 17025                | <a href="http://www.pjllabs.com/">http://www.pjllabs.com/</a>   | L16-57        |
| Louisiana DEQ            | <a href="http://www.deq.louisiana.gov/page/la-lab-accreditation">http://www.deq.louisiana.gov/page/la-lab-accreditation</a>   | 03016         |
| Maine DHS                | <a href="http://www.maine.gov/dhhs/">http://www.maine.gov/dhhs/</a>   | WA01276       |
| Minnesota DOH            | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>   | 053-999-457   |
| Nevada DEP               | <a href="http://ndep.nv.gov/bsdwlabservice.htm">http://ndep.nv.gov/bsdwlabservice.htm</a>   | WA01276       |
| New Jersey DEP           | <a href="http://www.nj.gov/dep/enforcement/oqa.html">http://www.nj.gov/dep/enforcement/oqa.html</a>   | WA005         |
| New York - DOH           | <a href="https://www.wadsworth.org/regulatory/elap">https://www.wadsworth.org/regulatory/elap</a>   | 12060         |
| North Carolina DEQ       | <a href="https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification">https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification</a> | 605           |
| Oklahoma DEQ             | <a href="http://www.deq.state.ok.us/CSDnew/labcert.htm">http://www.deq.state.ok.us/CSDnew/labcert.htm</a>   | 9801          |
| Oregon – DEQ (NELAP)     | <a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>   | WA100010      |
| South Carolina DHEC      | <a href="http://www.scdhec.gov/environment/EnvironmentalLabCertification/">http://www.scdhec.gov/environment/EnvironmentalLabCertification/</a>   | 61002         |
| Texas CEQ                | <a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>   | T104704427    |
| Washington DOE           | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>   | C544          |
| Wyoming (EPA Region 8)   | <a href="https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water">https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water</a>   | -             |
| Kelso Laboratory Website | <a href="http://www.alsglobal.com">www.alsglobal.com</a>  | NA            |

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at [www.ALSGlobal.com](http://www.ALSGlobal.com) or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



## Case Narrative

**ALS Environmental—Kelso Laboratory**  
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**Client:** ALS Environmental - US  
**Project:** HS19050082  
**Sample Matrix:** Ground Water

**Service Request:** K1903966  
**Date Received:** 05/03/2019

#### CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier level IV requested by the client.

#### Sample Receipt:

Three ground water samples were received for analysis at ALS Environmental on 05/03/2019. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

#### General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Noel D. Darr

Date 05/13/2019



## Chain of Custody

**ALS Environmental—Kelso Laboratory**  
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Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

119039166

## Subcontract Chain of Custody

**SAMPLING STATE:** Texas

**COC ID:** 11238

**SUBCONTRACT TO:**

ALS Environmental Kelso  
1317 S. 13th Avenue  
Kelso, WA 98626

**Phone:** +1 360 501 3312

**CUSTOMER INFORMATION:**

**Company:** ALS Houston  
**Contact:** RJ Modashia  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Email:** RJ.Modashia@alsglobal.com  
**Alternate Contact:** Jumoke M. Lawal  
**Email:** jumoke.lawal@alsglobal.com

**INVOICE INFORMATION:**

**Company:** ALS Houston  
**Contact:** Accounts Payable  
**Address:** 10450 Stancliff Rd, Ste 210  
**Phone:** +1 281 530 5656  
**Reference:** HS19050082  
**TSR:** Sonia West

|    | LAB SAMPLE ID                                  | CLIENT SAMPLE ID | MATRIX      | COLLECT DATE      |
|----|--|------------------|-------------|-------------------|
|    | ANALYSIS REQUESTED                             |                  |             | DUE DATE          |
| 1. | HS19050082-01                                  | 67WW13-190501    | Groundwater | 01 May 2019 08:00 |
|    | TOC Analysis with DOD Level IV/EquiS APTIM EDD |                  |             | 16 May 2019       |
| 2. | HS19050082-02                                  | 67WW13-190501 FD | Groundwater | 01 May 2019 08:00 |
|    | TOC Analysis with DOD Level IV/EquiS APTIM EDD |                  |             | 16 May 2019       |
| 3. | HS19050082-03                                  | 67WW08-190501    | Groundwater | 01 May 2019 08:00 |
|    | TOC Analysis with DOD Level IV/EquiS APTIM EDD |                  |             | 16 May 2019       |

**Comments:** Please analyze for the analysis listed above.  
Send report to the emails shown above.

**QC Level:** DOD IV (DoD Data Package)

Relinquished By:

Date/Time:

Received By:

Date/Time:

Cooler ID(s):

Temperature(s):

RIGHTS RESERVED BY ALS GLOBAL



## Cooler Receipt and Preservation Form

Client ALS-Houston Service Request K19 03966Received: 5/3/19 Opened: 5/3/19 By: DM Unloaded: 5/3/19 By: for

1. Samples were received via? USPS Fed Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? 2 Front
- If present, were custody seals intact? Y N If present, were they signed and dated? Y N

| Raw Cooler Temp | Corrected Cooler Temp | Raw Temp Blank | Corrected Temp Blank | Corr. Factor | Thermometer ID | Cooler/COC ID | Tracking Number     | NA | Filed |
|-----------------|-----------------------|----------------|----------------------|--------------|----------------|---------------|---------------------|----|-------|
| <u>-0.3</u>     | <u>-0.1</u>           | <u>2.0</u>     | <u>2.2</u>           | <u>+0.2</u>  | <u>879</u>     | <u>11238</u>  | <u>480978334533</u> |    |       |
|                 |                       |                |                      |              |                |               |                     |    |       |
|                 |                       |                |                      |              |                |               |                     |    |       |
|                 |                       |                |                      |              |                |               |                     |    |       |
|                 |                       |                |                      |              |                |               |                     |    |       |

4. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Were samples received in good condition (temperature, unbroken)? Indicate in the table below. NA Y N  
If applicable, tissue samples were received: Frozen Partially Thawed Thawed
7. Were all sample labels complete (i.e analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2. NA Y N
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below NA Y N
11. Were VOA vials received without headspace? Indicate in the table below. NA Y N
12. Was C12/Res negative? NA Y N

| Sample ID on Bottle | Sample ID on COC | Identified by: |
|---------------------|------------------|----------------|
|                     |                  |                |
|                     |                  |                |
|                     |                  |                |

| Sample ID | Bottle Count | Bottle Type | Out of Temp | Head-space | Broke | pH | Reagent | Volume added | Reagent Lot Number | Initials | Time |
|-----------|--------------|-------------|-------------|------------|-------|----|---------|--------------|--------------------|----------|------|
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |
|           |              |             |             |            |       |    |         |              |                    |          |      |

Notes, Discrepancies, & Resolutions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## General Chemistry

**ALS Environmental—Kelso Laboratory**  
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[www.alsglobal.com](http://www.alsglobal.com)

Analytical Report

**Client:** ALS Environmental - US  
**Project:** HS19050082  
**Sample Matrix:** Ground Water  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Service Request:** K1903966  
**Date Collected:** 05/1/19  
**Date Received:** 05/3/19  
**Units:** mg/L  
**Basis:** NA

Carbon, Total Organic

| Sample Name      | Lab Code     | Result | LOQ  | LOD  | MDL  | Dil. | Date Analyzed  | Q |
|------------------|--------------|--------|------|------|------|------|----------------|---|
| 67WW13-190501    | K1903966-001 | 2.91   | 0.50 | 0.20 | 0.07 | 1    | 05/07/19 18:56 |   |
| 67WW13-190501 FD | K1903966-002 | 3.24   | 0.50 | 0.20 | 0.07 | 1    | 05/07/19 19:53 |   |
| 67WW08-190501    | K1903966-003 | 2.09   | 0.50 | 0.20 | 0.07 | 1    | 05/07/19 20:21 |   |
| Method Blank     | K1903966-MB  | ND U   | 0.50 | 0.20 | 0.07 | 1    | 05/07/19 15:50 |   |

## ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

**Client:** ALS Environmental - US  
**Project** HS19050082  
**Sample Matrix:** Ground Water  
  
**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Service Request:** K1903966  
**Date Collected:** 05/01/19  
**Date Received:** 05/03/19

**Units:** mg/L  
**Basis:** NA

**Replicate Sample Summary**  
**Carbon, Total Organic**

| Sample Name:     | Lab Code:       | LOQ  | LOD  | MDL  | Sample Result | Duplicate Result | Average | RPD | RPD Limit | Date Analyzed |
|------------------|-----------------|------|------|------|---------------|------------------|---------|-----|-----------|---------------|
| 67WW13-190501    | K1903966-001DUP | 0.50 | 0.20 | 0.07 | 2.91          | 2.94             | 2.92    | <1  | 10        | 05/07/19      |
| 67WW13-190501 FD | K1903966-002DUP | 0.50 | 0.20 | 0.07 | 3.24          | 3.06             | 3.15    | 6   | 10        | 05/07/19      |
| 67WW08-190501    | K1903966-003DUP | 0.50 | 0.20 | 0.07 | 2.09          | 1.97             | 2.03    | 6   | 10        | 05/07/19      |

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.



QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS19050082  
**Sample Matrix:** Ground Water

**Service Request:** K1903966  
**Date Analyzed:** 05/07/19  
**Date Extracted:** NA

**Lab Control Sample Summary**  
**Carbon, Total Organic**

**Analysis Method:** SM 5310 C  
**Prep Method:** None

**Units:** mg/L  
**Basis:** NA  
**Analysis Lot:** 634658

| <b>Sample Name</b> | <b>Lab Code</b> | <b>Result</b> | <b>Spike Amount</b> | <b>% Rec</b> | <b>% Rec Limits</b> |
|--------------------|-----------------|---------------|---------------------|--------------|---------------------|
| Lab Control Sample | K1903966-LCS    | 25.3          | 25.0                | 101          | 83-117              |

QA/QC Report

**Client:** ALS Environmental - US  
**Project:** HS19050082

**Service Request:** K1903966

**Continuing Calibration Verification (CCV) Summary**

**Carbon, Total Organic**

**Analysis Method:** SM 5310 C

**Units:** mg/L

|      | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>True<br/>Value</b> | <b>Measured<br/>Value</b> | <b>Percent<br/>Recovery</b> | <b>Acceptance Limits</b> |
|------|-------------------------|-----------------|--------------------------|-----------------------|---------------------------|-----------------------------|--------------------------|
| CCV1 | 634658                  | KQ1906023-04    | 05/07/19 15:21           | 25.0                  | 25.1                      | 100                         | 90-110                   |
| CCV2 | 634658                  | KQ1906023-05    | 05/07/19 19:24           | 25.0                  | 25.6                      | 102                         | 90-110                   |
| CCV3 | 634658                  | KQ1906023-06    | 05/08/19 00:34           | 25.0                  | 24.8                      | 99                          | 90-110                   |

**Client:** ALS Environmental - US  
**Project:** HS19050082

**Service Request:** K1903966

**Continuing Calibration Blank (CCB) Summary**  
**Carbon, Total Organic**

**Analysis Method:** SM 5310 C

**Units:** mg/L

|      | <b>Analysis<br/>Lot</b> | <b>Lab Code</b> | <b>Date<br/>Analyzed</b> | <b>LOQ</b> | <b>LOD</b> | <b>MDL</b> | <b>Result</b> | <b>Q</b> |
|------|-------------------------|-----------------|--------------------------|------------|------------|------------|---------------|----------|
| CCB1 | 634658                  | KQ1906023-01    | 05/07/19 15:36           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB2 | 634658                  | KQ1906023-02    | 05/07/19 19:38           | 0.50       | 0.20       | 0.07       | ND            | U        |
| CCB3 | 634658                  | KQ1906023-03    | 05/08/19 00:49           | 0.50       | 0.20       | 0.07       | ND            | U        |



## Raw Data

**ALS Environmental—Kelso Laboratory**  
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## General Chemistry

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Work Request # <sup>Original</sup> ( K103899, 3947, 3763, 3889, 3965, 3966, 3997, 4006, )  
 Tier: I II II II IV IV I I  
 Date Analyzed: 5/7/19 DOC: 634658  
 Analyst: BCD Run # DOC: 634659  
 Analysis: DOC/DOC

### DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

- |     |   |                    |
|-----|---|--------------------|
| 1.  | Is the method name and number correct and appropriate?  | <u>yes</u> /no/NA  |
| 2.  | Holding times met for all analyses and for all samples?   | <u>yes</u> /no/NA  |
| 3.  | Are calculations correct?   | <u>yes</u> /no/NA  |
| 4.  | Is the reporting basis correct? (Dry Weight)  | yes/ <u>no</u> /NA |
| 5.  | All quality control criteria met?   | <u>yes</u> /no     |
| 6.  | Is the calibration curve correlation coefficient $\geq 0.995$ ?   | <u>yes</u> /no/NA  |
| 7.  | MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency?  | <u>yes</u> /no/NA  |
| 8.  | Are ICVs, CCVs, and CCBs all within acceptance limits?  | <u>yes</u> /no/NA  |
| 9.  | Are results for methods blanks all ND?  | <u>yes</u> /no/NA  |
| 10. | Are all QC samples within acceptance criteria?<br>(LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.)               | <u>yes</u> /no/NA  |
| 11. | Are all exceptions explained?   | <u>yes</u> /no/NA  |
| 12. | Have all applicable service requests been reviewed?   | <u>yes</u> /no/NA  |
| 13. | Are all samples labeled correctly?  | <u>yes</u> /no/NA  |
| 14. | Have all instructions on the service request been followed?<br>(e.g. Special MRLs, QC on a specific sample, Form V) | <u>yes</u> /no/NA  |
| 15. | Are detection limits and units reported correctly?  | <u>yes</u> /no/NA  |
| 16. | Is the unused space on the benchsheet crossed out?  | <u>yes</u> /no/NA  |
| 17. | Was analysis turned in by the due date? (n-2) (If not record SR#)   | <u>yes</u> /no/NA  |

#### COMMENTS:

Final Approved by: Hammer

Date: 05/09/19

DQREPORT

## Analytical Results Summary

Instrument Name: K-TOC-03

Analyst: BDITZLER

Analysis Lot: 634658 Method/Testcode: SM 5310 C/TOC T

| Lab Code     | Target Analytes       | QC  | Parent Sample | Matrix         | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed   | QC? | Tier |
|--------------|-----------------------|-----|---------------|----------------|------------|-------------|--------------|-----|------|------|-------|-------|-----------------|-----|------|
| K1903763-004 | Carbon, Total Organic | N/A |               | Water          | 7.05 mg/L  | 10 mL       | 705 mg/L     | 100 | 7    | 50   |       |       | 5/7/19 23:10:00 | N   | II   |
| K1903763-005 | Carbon, Total Organic | N/A |               | Water          | 7.11 mg/L  | 10 mL       | 711 mg/L     | 100 | 7    | 50   |       |       | 5/7/19 23:38:00 | N   | II   |
| K1903889-001 | Carbon, Total Organic | N/A |               | Water          | 7.75 mg/L  | 10 mL       | 7.75 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 21:46:00 | N   | II   |
| K1903889-002 | Carbon, Total Organic | N/A |               | Water          | 18.69 mg/L | 10 mL       | 18.7 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 22:14:00 | N   | II   |
| K1903889-003 | Carbon, Total Organic | N/A |               | Water          | 14.58 mg/L | 10 mL       | 14.6 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 22:42:00 | N   | II   |
| K1903965-001 | Carbon, Total Organic | N/A |               | Water          | 1.51 mg/L  | 10 mL       | 1.51 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 17:30:00 | N   | IV   |
| K1903966-001 | Carbon, Total Organic | N/A |               | Ground Water   | 2.91 mg/L  | 10 mL       | 2.91 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 18:56:00 | N   | IV   |
| K1903966-002 | Carbon, Total Organic | N/A |               | Ground Water   | 3.24 mg/L  | 10 mL       | 3.24 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 19:53:00 | N   | IV   |
| K1903966-003 | Carbon, Total Organic | N/A |               | Ground Water   | 2.09 mg/L  | 10 mL       | 2.09 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 20:21:00 | N   | IV   |
| K1903997-002 | Carbon, Total Organic | N/A |               | Drinking Water | 0.23 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 18:28:00 | N   | I    |
| K1904006-001 | Carbon, Total Organic | N/A |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 16:34:00 | N   | I    |
| K1904006-002 | Carbon, Total Organic | N/A |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 17:02:00 | N   | I    |
| KQ1906023-01 | Carbon, Total Organic | CCB |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 15:36:00 | N   | I    |
| KQ1906023-02 | Carbon, Total Organic | CCB |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 19:38:00 | N   | I    |
| KQ1906023-03 | Carbon, Total Organic | CCB |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/8/19 00:49:00 | N   | I    |
| KQ1906023-04 | Carbon, Total Organic | CCV |               | Reagent Water  | 25.09 mg/L | 10 mL       | 25.1 mg/L    | 1   |      |      |       |       | 5/7/19 15:21:00 | N   | I    |
| KQ1906023-05 | Carbon, Total Organic | CCV |               | Reagent Water  | 25.59 mg/L | 10 mL       | 25.6 mg/L    | 1   |      |      |       |       | 5/7/19 19:24:00 | N   | I    |
| KQ1906023-06 | Carbon, Total Organic | CCV |               | Reagent Water  | 24.77 mg/L | 10 mL       | 24.8 mg/L    | 1   |      |      |       |       | 5/8/19 00:34:00 | N   | I    |
| KQ1906023-07 | Carbon, Total Organic | MB  |               | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 15:50:00 | N   | I    |
| KQ1906023-08 | Carbon, Total Organic | LCS |               | Reagent Water  | 25.33 mg/L | 10 mL       | 25.3 mg/L    | 1   | 0.07 | 0.50 | 101   |       | 5/7/19 16:05:00 | N   | I    |
| KQ1906023-09 | Carbon, Total Organic | MS  | K1903965-001  | Water          | 27.53 mg/L | 10 mL       | 27.5 mg/L    | 1   | 0.07 | 0.50 | 104   |       | 5/7/19 17:59:00 | N   | IV   |
| KQ1906023-10 | Carbon, Total Organic | DUP | K1904006-001  | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       | NC    | 5/7/19 16:34:00 | N   | I    |
| KQ1906023-11 | Carbon, Total Organic | DUP | K1904006-002  | Reagent Water  | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       | NC    | 5/7/19 17:02:00 | N   | I    |
| KQ1906023-12 | Carbon, Total Organic | DUP | K1903965-001  | Water          | 1.53 mg/L  | 10 mL       | 1.53 mg/L    | 1   | 0.07 | 0.50 |       | <1    | 5/7/19 17:30:00 | N   | IV   |
| KQ1906023-13 | Carbon, Total Organic | DUP | K1903997-002  | Drinking Water | 0.19 mg/L  | 10 mL       | 0.19 mg/L    | J 1 | 0.07 | 0.50 |       | NC    | 5/7/19 18:28:00 | N   | I    |
| KQ1906023-14 | Carbon, Total Organic | DUP | K1903966-001  | Ground Water   | 2.94 mg/L  | 10 mL       | 2.94 mg/L    | 1   | 0.07 | 0.50 |       | <1    | 5/7/19 18:56:00 | N   | IV   |

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# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

05/09/19



# Analytical Results Summary

00954967

Instrument Name: K-TOC-03

Analyst: BDITZLER

Analysis Lot: 634658 Method/Testcode: SM 5310 C/TOC T

| <u>Lab Code</u> | <u>Target Analytes</u> | <u>QC</u> | <u>Parent Sample</u> | <u>Matrix</u> | <u>Raw Result</u> | <u>Sample Amt.</u> | <u>Final Result</u> | <u>Dil</u> | <u>MDL</u> | <u>PQL</u> | <u>% Rec</u> | <u>% RSD</u> | <u>Date Analyzed</u> | <u>QC?</u> | <u>Tier</u> |
|-----------------|------------------------|-----------|----------------------|---------------|-------------------|--------------------|---------------------|------------|------------|------------|--------------|--------------|----------------------|------------|-------------|
| KQ1906023-15    | Carbon, Total Organic  | DUP       | K1903966-002         | Ground Water  | 3.06 mg/L         | 10 mL              | 3.06 mg/L           | 1          | 0.07       | 0.50       |              | 6            | 5/7/19 19:53:00      | N          | IV          |
| KQ1906023-16    | Carbon, Total Organic  | DUP       | K1903966-003         | Ground Water  | 1.97 mg/L         | 10 mL              | 1.97 mg/L           | 1          | 0.07       | 0.50       |              | 6            | 5/7/19 20:21:00      | N          | IV          |
| KQ1906023-17    | Carbon, Total Organic  | DUP       | K1903889-001         | Water         | 7.70 mg/L         | 10 mL              | 7.70 mg/L           | 1          | 0.07       | 0.50       |              | <1           | 5/7/19 21:46:00      | N          | II          |
| KQ1906023-18    | Carbon, Total Organic  | DUP       | K1903889-002         | Water         | 18.53 mg/L        | 10 mL              | 18.5 mg/L           | 1          | 0.07       | 0.50       |              | <1           | 5/7/19 22:14:00      | N          | II          |
| KQ1906023-19    | Carbon, Total Organic  | DUP       | K1903889-003         | Water         | 14.36 mg/L        | 10 mL              | 14.4 mg/L           | 1          | 0.07       | 0.50       |              | 2            | 5/7/19 22:42:00      | N          | II          |
| KQ1906023-20    | Carbon, Total Organic  | DUP       | K1903763-004         | Water         | 7.05 mg/L         | 10 mL              | 705 mg/L            | 100        | 7          | 50         |              | <1           | 5/7/19 23:10:00      | N          | II          |
| KQ1906023-21    | Carbon, Total Organic  | DUP       | K1903763-005         | Water         | 6.92 mg/L         | 10 mL              | 692 mg/L            | 100        | 7          | 50         |              | 3            | 5/7/19 23:38:00      | N          | II          |

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

# Analytical Results Summary

00954968

Instrument Name: K-TOC-03

Analyst: BDITZLER

Analysis Lot: 634659 Method/Testcode: SM 5310 C/TOC D

| Lab Code     | Target Analytes                 | QC  | Parent Sample | Matrix   | Raw Result | Sample Amt. | Final Result | Dil | MDL  | PQL  | % Rec | % RSD | Date Analyzed   | QC? | Tier |
|--------------|---------------------------------|-----|---------------|----------|------------|-------------|--------------|-----|------|------|-------|-------|-----------------|-----|------|
| K1903899-001 | Carbon, Dissolved Organic (DOC) | N/A |               | Water    | 0.57 mg/L  | 10 mL       | 0.57 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/8/19 01:47:00 | N   | I    |
| K1903899-002 | Carbon, Dissolved Organic (DOC) | N/A |               | Water    | 19.98 mg/L | 10 mL       | 40.0 mg/L    | 2   | 0.2  | 1.0  |       |       | 5/8/19 02:44:00 | N   | I    |
| K1903947-001 | Carbon, Dissolved Organic (DOC) | N/A |               | Effluent | 1.72 mg/L  | 10 mL       | 1.72 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 20:49:00 | N   | II   |
| K1903947-002 | Carbon, Dissolved Organic (DOC) | N/A |               | Effluent | 1.41 mg/L  | 10 mL       | 1.41 mg/L    | 1   | 0.07 | 0.50 |       |       | 5/7/19 21:17:00 | N   | II   |
| KQ1906022-01 | Carbon, Dissolved Organic (DOC) | CCB |               | Effluent | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/7/19 19:38:00 | N   | II   |
| KQ1906022-02 | Carbon, Dissolved Organic (DOC) | CCB |               | Effluent | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/8/19 00:49:00 | N   | II   |
| KQ1906022-03 | Carbon, Dissolved Organic (DOC) | CCB |               | Effluent | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/8/19 03:55:00 | N   | II   |
| KQ1906022-04 | Carbon, Dissolved Organic (DOC) | CCV |               | Effluent | 25.09 mg/L | 10 mL       | 25.1 mg/L    | 1   |      |      |       |       | 5/7/19 19:24:00 | N   | II   |
| KQ1906022-05 | Carbon, Dissolved Organic (DOC) | CCV |               | Effluent | 25.59 mg/L | 10 mL       | 25.6 mg/L    | 1   |      |      |       |       | 5/8/19 00:34:00 | N   | II   |
| KQ1906022-06 | Carbon, Dissolved Organic (DOC) | CCV |               | Effluent | 24.60 mg/L | 10 mL       | 24.6 mg/L    | 1   |      |      |       |       | 5/8/19 03:41:00 | N   | II   |
| KQ1906022-07 | Carbon, Dissolved Organic (DOC) | MS  | K1903899-001  | Water    | 26.19 mg/L | 10 mL       | 26.2 mg/L    | 1   | 0.07 | 0.50 | 102   |       | 5/8/19 02:15:00 | N   | II   |
| KQ1906022-08 | Carbon, Dissolved Organic (DOC) | DUP | K1903899-001  | Water    | 0.60 mg/L  | 10 mL       | 0.60 mg/L    | 1   | 0.07 | 0.50 |       | 4     | 5/8/19 01:47:00 | N   | II   |
| KQ1906022-09 | Carbon, Dissolved Organic (DOC) | DUP | K1903899-002  | Water    | 19.75 mg/L | 10 mL       | 39.5 mg/L    | 2   | 0.2  | 1.0  |       | 1     | 5/8/19 02:44:00 | N   | II   |
| KQ1906022-10 | Carbon, Dissolved Organic (DOC) | DUP | K1903947-001  | Effluent | 1.72 mg/L  | 10 mL       | 1.72 mg/L    | 1   | 0.07 | 0.50 |       | <1    | 5/7/19 20:49:00 | N   | II   |
| KQ1906022-11 | Carbon, Dissolved Organic (DOC) | DUP | K1903947-002  | Effluent | 1.39 mg/L  | 10 mL       | 1.39 mg/L    | 1   | 0.07 | 0.50 |       | 1     | 5/7/19 21:17:00 | N   | II   |
| KQ1906022-12 | Carbon, Dissolved Organic (DOC) | MB  |               | Effluent | 0.00 mg/L  | 10 mL       | 0.50 mg/L    | U 1 | 0.07 | 0.50 |       |       | 5/8/19 01:03:00 | N   | II   |
| KQ1906022-13 | Carbon, Dissolved Organic (DOC) | LCS |               | Effluent | 25.33 mg/L | 10 mL       | 25.3 mg/L    | 1   | 0.07 | 0.50 | 101   |       | 5/8/19 01:18:00 | N   | II   |

05/09/19  
*[Handwritten signature]*

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

## ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER)

Method: Oxidation EPA 415.1/9060/5310C

| Printout | Sample #            | Dil. Factor | Solution Conc.,mg/L | Blank Correction, mg/L | Net mg/L | TOC mg/L | Reported TOC mg/L |          |
|----------|---------------------|-------------|---------------------|------------------------|----------|----------|-------------------|----------|
| CBA      | RB                  | 1           |                     |                        | 0.0000   | 0        | <0.5              |          |
| 2        | C] CCV 25 ppm [25 p | 1           | 25.087              | 0.0000                 | 25.0871  | 25.0871  | 25.1              | 5/7/2019 |
| 3        | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 4        | MB1                 | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 5        | [TOC] LCS [24ppm]   | 1           | 25.331              | 0.0000                 | 25.3309  | 25.3309  | 25.3              | 5/7/2019 |
| 6        | K1904006-001        | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 7        | K1904006-001d       | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 8        | K1904006-002        | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 9        | K1904006-002d       | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 10       | K1903965-001        | 1           | 1.514               | 0.0000                 | 1.5136   | 1.5136   | 1.51              | 5/7/2019 |
| 11       | K1903965-001d       | 1           | 1.525               | 0.0000                 | 1.5251   | 1.5251   | 1.5               | 5/7/2019 |
| 12       | K1903965-001ms      | 1           | 27.527              | 0.0000                 | 27.5274  | 27.5274  | 27.53             | 5/7/2019 |
| 13       | K1903997-002        | 1           | 0.234               | 0.0000                 | 0.2341   | 0.2341   | <0.5              | 5/7/2019 |
| 14       | K1903997-002d       | 1           | 0.188               | 0.0000                 | 0.1882   | 0.1882   | <0.5              | 5/7/2019 |
| 15       | K1903966-001        | 1           | 2.909               | 0.0000                 | 2.9090   | 2.909    | 2.9               | 5/7/2019 |
| 16       | K1903966-001d       | 1           | 2.938               | 0.0000                 | 2.9382   | 2.9382   | 2.9               | 5/7/2019 |
| 17       | C] CCV 25 ppm [25 p | 1           | 25.595              | 0.0000                 | 25.5949  | 25.5949  | 25.59             | 5/7/2019 |
| 18       | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 19       | K1903966-002        | 1           | 3.244               | 0.0000                 | 3.2436   | 3.2436   | 3.2               | 5/7/2019 |
| 20       | K1903966-002d       | 1           | 3.056               | 0.0000                 | 3.0563   | 3.0563   | 3.06              | 5/7/2019 |
| 21       | K1903966-003        | 1           | 2.094               | 0.0000                 | 2.0936   | 2.0936   | 2.09              | 5/7/2019 |
| 22       | K1903966-003d       | 1           | 1.973               | 0.0000                 | 1.9725   | 1.9725   | 2.0               | 5/7/2019 |
| 23       | K1903889-001        | 1           | 7.745               | 0.0000                 | 7.7454   | 7.7454   | 7.7               | 5/7/2019 |
| 24       | K1903889-001d       | 1           | 7.704               | 0.0000                 | 7.7043   | 7.7043   | 7.70              | 5/7/2019 |
| 25       | K1903889-002        | 1           | 18.694              | 0.0000                 | 18.6941  | 18.6941  | 18.69             | 5/7/2019 |

ICAL Date 10/20/16 ICAL ID#:11-GEN-05-51A

LCS =24.0 ppm APG 4013 Lot #010615 (REF# 11-GEN-05-50N)

CCV = 25.0 ppm (Ref.#11-GEN-05-52E)

Spike: 0.05 ml of 5000 ppm stock ----&gt; 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

|                                 |                         |
|---------------------------------|-------------------------|
| Analyzed By: <i>[Signature]</i> | Date Analyzed: 5/7/19   |
| Reviewed By: <i>[Signature]</i> | Date Reviewed: 05/09/19 |

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

## ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER)

Method: Oxidation EPA 415.1/9060/5310C

| Printout | Sample #            | Dil. Factor | Solution Conc.,mg/L | Blank Correction, mg/L | Net mg/L | TOC mg/L | Reported TOC mg/L |          |
|----------|---------------------|-------------|---------------------|------------------------|----------|----------|-------------------|----------|
| 26       | K1903889-002d       | 1           | 18.527              | 0.0000                 | 18.5272  | 18.5272  | 18.53             | 5/7/2019 |
| 27       | K1903889-003        | 1           | 14.578              | 0.0000                 | 14.5782  | 14.5782  | 14.58             | 5/7/2019 |
| 28       | K1903889-003d       | 1           | 14.359              | 0.0000                 | 14.3593  | 14.3593  | 14.4              | 5/7/2019 |
| 29       | K1903763-004        | 100         | 7.047               | 0.0000                 | 7.0467   | 704.67   | 704.7             | 5/7/2019 |
| 30       | K1903763-004d       | 100         | 7.049               | 0.0000                 | 7.0489   | 704.89   | 704.9             | 5/7/2019 |
| 31       | K1903763-005        | 100         | 7.110               | 0.0000                 | 7.1097   | 710.97   | 711.0             | 5/7/2019 |
| 32       | K1903763-005d       | 100         | 6.923               | 0.0000                 | 6.9234   | 692.34   | 692.3             | 5/7/2019 |
| 33       | C] CCV 25 ppm [25 g | 1           | 24.769              | 0.0000                 | 24.7687  | 24.7687  | 24.8              | 5/8/2019 |
| 34       | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/8/2019 |
| 35       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 36       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 37       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 38       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 39       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 40       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 41       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 42       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 43       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 44       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 45       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 46       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 47       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 48       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 49       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 50       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |

|                                 |                                |
|---------------------------------|--------------------------------|
| Analyzed By: <i>BCD</i>         | Date Analyzed: <i>5/7/19</i>   |
| Reviewed By: <i>[Signature]</i> | Date Reviewed: <i>05/09/19</i> |

## ALS ENVIRONMENTAL

Matrix: WATER

Analysis: Total Organic Carbon (WATER)Method: Oxidation EPA 415.1/9060/5310C

| Printout | Sample #            | Dil. Factor | Solution Conc.,mg/L | Blank Correction, mg/L | Net mg/L | TOC mg/L | Reported TOC mg/L |          |
|----------|---------------------|-------------|---------------------|------------------------|----------|----------|-------------------|----------|
| CBA      | RB                  | 1           |                     |                        | 0.0000   | 0        | <0.5              |          |
| 2        | C] CCV 25 ppm [25 p | 1           | 25.595              | 0.0000                 | 25.5949  | 25.5949  | 25.6              | 5/7/2019 |
| 3        | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/7/2019 |
| 4        | K1903947-001        | 1           | 1.718               | 0.0000                 | 1.7176   | 1.7176   | 1.7               | 5/7/2019 |
| 5        | K1903947-001d       | 1           | 1.717               | 0.0000                 | 1.7166   | 1.7166   | 1.7               | 5/7/2019 |
| 6        | K1903947-002        | 1           | 1.410               | 0.0000                 | 1.4096   | 1.4096   | 1.41              | 5/7/2019 |
| 7        | K1903947-002d       | 1           | 1.391               | 0.0000                 | 1.3912   | 1.3912   | 1.4               | 5/7/2019 |
| 8        | C] CCV 25 ppm [25 p | 1           | 24.769              | 0.0000                 | 24.7687  | 24.7687  | 25                | 5/8/2019 |
| 9        | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/8/2019 |
| 10       | MB2                 | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/8/2019 |
| 11       | [TOC] LCS [24ppm]   | 1           | 25.084              | 0.0000                 | 25.0838  | 25.0838  | 25.1              | 5/8/2019 |
| 12       | K1903899-001        | 1           | 0.575               | 0.0000                 | 0.5749   | 0.5749   | 0.57              | 5/8/2019 |
| 13       | K1903899-001d       | 1           | 0.597               | 0.0000                 | 0.5970   | 0.597    | 0.60              | 5/8/2019 |
| 14       | K1903899-001ms      | 1           | 26.188              | 0.0000                 | 26.1881  | 26.1881  | 26.19             | 5/8/2019 |
| 15       | K1903899-002        | 2           | 19.983              | 0.0000                 | 19.9825  | 39.965   | 40.0              | 5/8/2019 |
| 16       | K1903899-002d       | 2           | 19.747              | 0.0000                 | 19.7471  | 39.4942  | 39.5              | 5/8/2019 |
| 17       | C] CCV 25 ppm [25 p | 1           | 24.602              | 0.0000                 | 24.6022  | 24.6022  | 24.60             | 5/8/2019 |
| 18       | [TOC] CCB [0 ppm]   | 1           | 0.000               | 0.0000                 | 0.0000   | 0        | <0.5              | 5/8/2019 |
| 19       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 20       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 21       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 22       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 23       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 24       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |
| 25       |                     | 1           |                     | 0.0000                 | 0.0000   | 0        | <0.5              |          |

ICAL Date 10/20/16 ICAL ID#:11-GEN-05-51A

LCS =24.0 ppm APG 4013 Lot #010615 (REF# 11-GEN-05-50N)

CCV = 25.0 ppm (Ref.#11-GEN-05-52E)

Spike: 0.05 ml of 5000 ppm stock ----&gt; 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

|                                 |                                |
|---------------------------------|--------------------------------|
| Analyzed By: <i>BKD</i>         | Date Analyzed: <i>5/7/19</i>   |
| Reviewed By: <i>[Signature]</i> | Date Reviewed: <i>05/09/19</i> |

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

TOC: 634658  
DOC: 634659

## Schedule: Daily Run Method 010711

Version: 73

Instrument: Fusion1

Last Saved by: Fusion1 (Fusion1)

Last Saved on: 2019/05/07 17:17 - Tuesday

| Position | Sample Type    | Sample ID                 | Method ID (Calibration ID)        | Reps | Use   | State |
|----------|----------------|---------------------------|-----------------------------------|------|-------|-------|
| (Clean)  | Clean          | Clean                     |                                   | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                     |                                   | 1    | True  | Ready |
| (Clean)  | Clean          | Clean                     |                                   | 1    | True  | Ready |
| (Blank)  | Blank          | Reagent/Acid Blank        |                                   | 1    | True  | Ready |
| D        | Sample         | RB                        | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| B        | Check Standard | [TOC] CCV 25 ppm [25 ppm] | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| D        | Check Standard | [TOC] CCB [0 ppm]         | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 1        | Sample         | MB1                       | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| C        | Check Standard | [TOC] LCS [24.0 ppm]      | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 2        | Sample         | ICS                       | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 3        | Sample         | K1904006-001.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 4        | Sample         | K1904006-002.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 5        | Sample         | K1903965-001.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 6        | Sample         | K1903965-001.01 ms        | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 7        | Sample         | RB                        | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 8        | Sample         | K1903997-002.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 9        | Sample         | K1903966-001.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| B        | Check Standard | [TOC] CCV 25 ppm [25 ppm] | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| D        | Check Standard | [TOC] CCB [0 ppm]         | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 10       | Sample         | K1903966-002.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 11       | Sample         | K1903966-003.01           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 12       | Sample         | K1903947-001.03 doc       | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 13       | Sample         | K1903947-002.03 doc       | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 14       | Sample         | K1903889-001.18           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 15       | Sample         | K1903889-002.18           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 16       | Sample         | K1903889-003.18           | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 17       | Sample         | K1903763-004.01 100x      | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 18       | Sample         | K1903763-005.01 100x      | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 19       | Sample         | RB                        | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| B        | Check Standard | [TOC] CCV 25 ppm [25 ppm] | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| D        | Check Standard | [TOC] CCB [0 ppm]         | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 20       | Sample         | MB2                       | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| C        | Check Standard | [TOC] LCS [24.0 ppm]      | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 21       | Sample         | FB                        | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 22       | Sample         | K1903899-001.01 doc       | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 23       | Sample         | K1903899-001.01 ms doc    | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 24       | Sample         | RB                        | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| 25       | Sample         | K1903899-002.01 doc 2x    | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| 26       | Sample         | RB                        | CAS_salt_010711 (CAS_salt_010711) | 2    | True  | Ready |
| B        | Check Standard | [TOC] CCV 25 ppm [25 ppm] | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
| D        | Check Standard | [TOC] CCB [0 ppm]         | CAS_salt_010711 (CAS_salt_010711) | 1    | True  | Ready |
|          |                |                           |                                   |      | False |       |

05/09/19  
Fusion1

**Fusion Report - Daily Run Method 010711**  
**Tuesday, May 07, 2019 01:17 PM**(View - Reps, Unused Reps, Meta-  
Data, Signature, History)  
Printed on 2019/05/08 13:29 -  
Wednesday**Report Summary Information**

Company Location: Gen Chem Lab  
 Schedule Name: Daily Run Method 010711  
 Instrument Name: Fusion1  
 Report Version: 1 of 1  
 Report Creation by Operators (schedule version): Fusion1 (Fusion1) (v72)  
 Fusion1 (Fusion1) (v73)  
 Comment:

Engine 1.1.5.1  
 Version:  
 Firmware 1.2.0696  
 Version:  
 Connection: RS232 COM1

**Report Results**05/09/19  
*Huey***Sample Type:** Clean

From Schedule Version 72

| Pos       | Analysis Type | Sample ID | Start Time       |
|-----------|---------------|-----------|------------------|
| ♦ (clean) |               | Clean     | 2019/05/07 13:17 |

| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|----------------|------------|----------------|-----------------|----------|
| 1     | IC Clean           | 15.02          | 18.20      | 3.18           | 49.67           | 05:27    |
| 2     | TC Clean           | 18.18          | 21.33      | 3.15           | 49.78           | 07:17    |
| 3     | TC Clean           | 2.88           | 5.93       | 3.05           | 49.86           | 07:03    |
| 4     | TC Clean           | 1.89           | 5.02       | 3.13           | 50.02           | 03:50    |

**Sample Type:** Clean

From Schedule Version 72

| Pos       | Analysis Type | Sample ID | Start Time       |
|-----------|---------------|-----------|------------------|
| ♦ (clean) |               | Clean     | 2019/05/07 13:45 |

| Rep # | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|----------------|------------|----------------|-----------------|----------|
| 1     | IC Clean           | 1.15           | 4.12       | 2.97           | 49.61           | 05:15    |
| 2     | TC Clean           | 4.52           | 7.64       | 3.12           | 49.87           | 07:14    |
| 3     | TC Clean           | 1.56           | 4.66       | 3.10           | 50.01           | 03:47    |
| 4     | TC Clean           | 1.10           | 4.11       | 3.01           | 50.03           | 03:50    |



| <b>Sample Type:</b> Clean |                    |                |            | From Schedule Version 72 |                 |          |
|---------------------------|--------------------|----------------|------------|--------------------------|-----------------|----------|
| Pos                       | Analysis Type      | Sample ID      |            | Start Time               |                 |          |
| ♦ (clean)                 |                    | Clean          |            | 2019/05/07 14:10         |                 |          |
| Rep #                     | Base Analysis Type | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs)           | Pressure (psig) | Run Time |
| 1                         | IC Clean           | 0.72           | 3.62       | 2.90                     | 49.71           | 05:13    |
| 2                         | TC Clean           | 3.80           | 6.60       | 2.80                     | 50.01           | 04:04    |
| 3                         | TC Clean           | 1.46           | 4.45       | 2.99                     | 50.00           | 03:48    |
| 4                         | TC Clean           | 1.30           | 4.20       | 2.90                     | 50.01           | 03:49    |

| <b>Sample Type:</b> Blank (Creating v1253) |                    |                    |            | From Schedule Version 72 |                 |          |
|--|--------------------|--------------------|------------|--------------------------|-----------------|----------|
| Pos  | Analysis Type      | Sample ID          |            | Start Time               |                 |          |
| ♦ (blank)                                  |                    | Reagent/Acid Blank |            | 2019/05/07 14:32         |                 |          |
| Rep #                                      | Base Analysis Type | Adjusted (Abs)     | NDIR (Abs) | Baseline (Abs)           | Pressure (psig) | Run Time |
| 1  | IC Clean           | 0.83               | 3.79       | 2.96                     | 49.69           | 05:25    |
| 2  | TC Clean           | 3.69               | 6.70       | 3.01                     | 50.02           | 04:05    |
| 3  | TC Clean           | 1.84               | 4.72       | 2.88                     | 50.04           | 03:50    |
| 4  | TC Clean           | 1.34               | 4.28       | 2.94                     | 50.03           | 03:56    |
| 5  | Reagent Blank      | 4.03               | 7.02       | 3.00                     | 50.02           | 05:07    |
| 6  | Acid Blank         | 1.19               | 4.24       | 3.05                     | 49.65           | 05:29    |

Sample Type: Sample

From Schedule Version 72

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |  |  |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|--|--|
| ♦ | D   | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 15:06 |  |  |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 8.34           | 11.47      | 3.13           | 50.15           | 10:31    |

Dilution

1:10

Blank Contribution

(TC) 8.7847 (IC) (v1253)

Method

CAS\_salt\_010711 (v4)

Calibration

CAS\_salt\_010711 (v30)

**Sample Type:** Check Standard --> CCV 25 ppm

From Schedule Version 72

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|---------------------------|--------------------------|--------------------|------------|-----|------------------|
| ♦ | B   | TOC | 25.0000             | 1:2 | [TOC] CCV 25 ppm [25 ppm] | 0 / infinity ( NA / NA ) | 25.0871 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/07 15:21 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.0871 | 250.8707 | 179.75   | 182.77 | 3.02     | 50.10    | 10:32    |

**Completion State**

Success - Criteria met.

**Success Action**

Do Nothing

**Method**

CAS\_salt\_010711 (v4)

**Calibration**

CAS\_salt\_010711 (v30)

**STD Conc - Pos B**

50 ppmC

**Sample Type:** Check Standard --> CCB

From Schedule Version 72

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID         | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|-------------------|--------------------------|-------------------|------------|-----|------------------|
| ♦ | D   | TOC | 0.0000              | 1:1 | [TOC] CCB [0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/07 15:36 |

| Pos | Base Analysis Type | ID    | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|-------|-------|--------|--------|----------|------|----------|----------|----------|
| D   | TOC                | 0 ppm | 1     | 0.0000 | 0.0000 | 6.82     | 9.78 | 2.96     | 50.14    | 10:32    |

**Completion State**

Success - Criteria met.

**Success Action**

Do Nothing

**Method**

CAS\_salt\_010711 (v4)

**Calibration**

CAS\_salt\_010711 (v30)

**STD Conc - Pos D**

0 ppmC

**Sample Type:** Sample

From Schedule Version 72

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ♦ | 1   | TOC           | MB1       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 15:50 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 6.98           | 10.03      | 3.04           | 50.16           | 10:30    |

**Dilution**

1:10

**Blank Contribution**

(TC) 8.7847 (IC) (v1253)

**Method**

CAS\_salt\_010711 (v4)

**Calibration**

CAS\_salt\_010711 (v30)

**Sample Type:** Check Standard --> LCS

From Schedule Version 72

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID            | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|----------------------|--------------------------|--------------------|------------|-----|------------------|
| ♦ | C   | TOC | 25.0000             | 1:1 | [TOC] LCS [24.0 ppm] | 0 / infinity ( NA / NA ) | 25.3309 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/07 16:05 |

| Pos | Base Analysis | ID | Rep # | ppm | µg | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|---------------|----|-------|-----|----|----------|------|----------|----------|----------|
|-----|---------------|----|-------|-----|----|----------|------|----------|----------|----------|

|                         | Type |                       |   |                      |          |                       |        |                         |       |       |
|-------------------------|------|-----------------------|---|----------------------|----------|-----------------------|--------|-------------------------|-------|-------|
| C                       | TOC  | 25.0 ppm              | 1 | 25.3309              | 253.3088 | 181.41                | 184.42 | 3.01                    | 50.11 | 10:30 |
| <u>Completion State</u> |      | <u>Success Action</u> |   | <u>Method</u>        |          | <u>Calibration</u>    |        | <u>STD Conc - Pos C</u> |       |       |
| Success - Criteria met. |      | Do Nothing            |   | CAS_salt_010711 (v4) |          | CAS_salt_010711 (v30) |        | 25 ppmC                 |       |       |

Sample Type: Sample

From Schedule Version 72

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | 2   | TOC           | ICS       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 16:20 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 8.36           | 11.40      | 3.04           | 50.15           | 10:29    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ◆ | 3   | TOC           | K1904006-001.01 | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 16:34 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 5.80           | 8.61       | 2.81           | 50.17           | 10:29    |
| 2     | TOC                | 0.0000 | 0.0000 | 6.00           | 8.81       | 2.81           | 50.19           | 10:26    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

|   |     |               |                 |               |                  |         |                  |  |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|--|
|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |  |
| ◆ | 4   | TOC           | K1904006-002.01 | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 17:02 |  |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 5.72           | 8.65       | 2.93           | 50.20           | 10:31    |
| 2     | TOC                | 0.0000 | 0.0000 | 5.83           | 8.72       | 2.88           | 50.26           | 10:29    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)Sample Type: Sample

From Schedule Version 73

|       | Pos                | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD        | Start Time       |                 |          |
|-------|--------------------|---------------|-----------------|---------------|------------------|------------|------------------|-----------------|----------|
| *     | 5                  | TOC           | K1903965-001.01 | 1.5194 ppm    | 0.0081 ppm       | 0.5300%    | 2019/05/07 17:30 |                 |          |
| Rep # | Base Analysis Type |               | ppm             | µg            | Adjusted (Abs)   | NDIR (Abs) | Baseline (Abs)   | Pressure (psig) | Run Time |
| 1     | TOC                |               | 1.5136          | 15.1361       | 19.06            | 22.10      | 3.04             | 50.20           | 10:29    |
|       |                    |               |                 |               |                  |            |                  |                 |          |

|   |     |        |         |       |       |      |       |       |
|---|-----|--------|---------|-------|-------|------|-------|-------|
| 2 | TOC | 1.5251 | 15.2510 | 19.14 | 21.98 | 2.84 | 50.22 | 10:27 |
|---|-----|--------|---------|-------|-------|------|-------|-------|

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID          | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|--------------------|---------------|------------------|---------|------------------|
| * 6 | TOC           | K1903965-001.01 ms | 27.5274 ppm   | 0.0000 ppm       | 0.0000% | 2019/05/07 17:59 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 27.5274 | 275.2739 | 195.64         | 198.75     | 3.11           | 50.23           | 10:34    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| * 7 | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/07 18:13 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 6.87           | 9.75       | 2.88           | 50.22           | 10:30    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD      | Start Time       |
|-----|---------------|-----------------|---------------|------------------|----------|------------------|
| * 8 | TOC           | K1903997-002.01 | 0.2112 ppm    | 0.0325 ppm       | 15.3900% | 2019/05/07 18:28 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.2341 | 2.3413 | 10.37          | 13.22      | 2.85           | 50.22           | 10:29    |
| 2     | TOC                | 0.1882 | 1.8817 | 10.06          | 13.08      | 3.02           | 50.18           | 10:25    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| * 9 | TOC           | K1903966-001.01 | 2.9236 ppm    | 0.0206 ppm       | 0.7100% | 2019/05/07 18:56 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.9090 | 29.0903 | 28.53          | 31.45      | 2.92           | 50.07           | 10:28    |
| 2     | TOC                | 2.9382 | 29.3819 | 28.73          | 31.64      | 2.91           | 50.03           | 10:28    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)Sample Type: Check Standard --> CCV 25 ppm

From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|---------------------------|--------------------------|--------------------|------------|-----|------------------|
| ♦ | B   | TOC | 25.0000             | 1:2 | [TOC] CCV 25 ppm [25 ppm] | 0 / infinity ( NA / NA ) | 25.5949 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/07 19:24 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 25.5949 | 255.9488 | 183.20   | 186.12 | 2.92     | 49.99    | 10:32    |

|                         |                       |                      |                       |                         |
|-------------------------|-----------------------|----------------------|-----------------------|-------------------------|
| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>        | <u>Calibration</u>    | <u>STD Conc - Pos B</u> |
| Success - Criteria met. | Do Nothing            | CAS_salt_010711 (v4) | CAS_salt_010711 (v30) | 50 ppmC                 |

**Sample Type:** Check Standard --> CCB From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID         | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|-------------------|--------------------------|-------------------|------------|-----|------------------|
| ♦ | D   | TOC | 0.0000              | 1:1 | [TOC] CCB [0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/07 19:38 |

| Pos | Base Analysis Type | ID    | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|-------|-------|--------|--------|----------|------|----------|----------|----------|
| D   | TOC                | 0 ppm | 1     | 0.0000 | 0.0000 | 6.81     | 9.62 | 2.81     | 49.94    | 10:31    |

|                         |                       |                      |                       |                         |
|-------------------------|-----------------------|----------------------|-----------------------|-------------------------|
| <u>Completion State</u> | <u>Success Action</u> | <u>Method</u>        | <u>Calibration</u>    | <u>STD Conc - Pos D</u> |
| Success - Criteria met. | Do Nothing            | CAS_salt_010711 (v4) | CAS_salt_010711 (v30) | 0 ppmC                  |

**Sample Type:** Sample From Schedule Version 73

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ♦ | 10  | TOC           | K1903966-002.01 | 3.1500 ppm    | 0.1324 ppm       | 4.2000% | 2019/05/07 19:53 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 3.2436 | 32.4359 | 30.80          | 33.67      | 2.87           | 49.91           | 10:29    |
| 2     | TOC                | 3.0563 | 30.5635 | 29.53          | 32.51      | 2.97           | 49.92           | 10:27    |

|                 |                           |                      |                       |
|-----------------|---------------------------|----------------------|-----------------------|
| <u>Dilution</u> | <u>Blank Contribution</u> | <u>Method</u>        | <u>Calibration</u>    |
| 1:10            | (TC) 8.7847 (IC) (v1253)  | CAS_salt_010711 (v4) | CAS_salt_010711 (v30) |

|   | Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| ♦ | 11  | TOC           | K1903966-003.01 | 2.0331 ppm    | 0.0856 ppm       | 4.2100% | 2019/05/07 20:21 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 2.0936 | 20.9361 | 23.00          | 25.79      | 2.79           | 49.90           | 10:26    |
| 2     | TOC                | 1.9725 | 19.7251 | 22.17          | 25.11      | 2.94           | 49.88           | 10:29    |

|                 |                           |               |                    |
|-----------------|---------------------------|---------------|--------------------|
| <u>Dilution</u> | <u>Blank Contribution</u> | <u>Method</u> | <u>Calibration</u> |
|                 |                           |               |                    |

1:10 (TC) 8.7847 (IC) CAS\_salt\_010711 CAS\_salt\_010711  
(v1253) (v4) (v30)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 12  | TOC           | K1903947-001.03 doc | 1.7171 ppm    | 0.0007 ppm       | 0.0400% | 2019/05/07 20:49 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.7176 | 17.1765 | 20.44          | 23.25      | 2.81           | 49.88           | 10:29    |
| 2     | TOC                | 1.7166 | 17.1662 | 20.44          | 23.33      | 2.89           | 49.88           | 10:24    |

Dilution 1:10 Blank Contribution (TC) 8.7847 (IC) (v1253) Method CAS\_salt\_010711 (v4) Calibration CAS\_salt\_010711 (v30)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 13  | TOC           | K1903947-002.03 doc | 1.4004 ppm    | 0.0130 ppm       | 0.9300% | 2019/05/07 21:17 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 1.4096 | 14.0960 | 18.35          | 21.27      | 2.92           | 49.88           | 10:28    |
| 2     | TOC                | 1.3912 | 13.9119 | 18.23          | 21.18      | 2.95           | 49.90           | 10:29    |

Dilution 1:10 Blank Contribution (TC) 8.7847 (IC) (v1253) Method CAS\_salt\_010711 (v4) Calibration CAS\_salt\_010711 (v30)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 14  | TOC           | K1903889-001.18 | 7.7248 ppm    | 0.0291 ppm       | 0.3800% | 2019/05/07 21:46 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 7.7454 | 77.4540 | 61.36          | 64.31      | 2.95           | 49.95           | 10:26    |
| 2     | TOC                | 7.7043 | 77.0429 | 61.08          | 64.04      | 2.95           | 49.92           | 10:27    |

Dilution 1:10 Blank Contribution (TC) 8.7847 (IC) (v1253) Method CAS\_salt\_010711 (v4) Calibration CAS\_salt\_010711 (v30)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 15  | TOC           | K1903889-002.18 | 18.6106 ppm   | 0.1180 ppm       | 0.6300% | 2019/05/07 22:14 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 18.6941 | 186.9408 | 135.68         | 138.58     | 2.90           | 49.93           | 10:26    |
| 2     | TOC                | 18.5272 | 185.2716 | 134.55         | 137.69     | 3.14           | 49.92           | 10:30    |

Dilution 1:10 Blank Contribution (TC) 8.7847 (IC) (v1253) Method CAS\_salt\_010711 (v4) Calibration CAS\_salt\_010711 (v30)

| Pos | Analysis Type | Sample ID       | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------------|---------------|------------------|---------|------------------|
| 16  | TOC           | K1903889-003.18 | 14.4688 ppm   | 0.1548 ppm       | 1.0700% | 2019/05/07 22:42 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 14.5782 | 145.7825 | 107.74         | 110.49     | 2.75           | 49.95           | 10:29    |
| 2     | TOC                | 14.3593 | 143.5933 | 106.26         | 109.26     | 3.01           | 49.96           | 10:23    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID            | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|----------------------|---------------|------------------|---------|------------------|
| 17  | TOC           | K1903763-004.01 100x | 7.0478 ppm    | 0.0016 ppm       | 0.0200% | 2019/05/07 23:10 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 7.0467 | 70.4666 | 56.62          | 59.72      | 3.10           | 49.99           | 10:26    |
| 2     | TOC                | 7.0489 | 70.4887 | 56.63          | 59.56      | 2.93           | 50.00           | 10:28    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID            | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|----------------------|---------------|------------------|---------|------------------|
| 18  | TOC           | K1903763-005.01 100x | 7.0165 ppm    | 0.1318 ppm       | 1.8800% | 2019/05/07 23:38 |

| Rep # | Base Analysis Type | ppm    | µg      | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|---------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 7.1097 | 71.0971 | 57.04          | 59.88      | 2.84           | 50.01           | 10:28    |
| 2     | TOC                | 6.9234 | 69.2335 | 55.78          | 58.54      | 2.76           | 50.01           | 10:28    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 19  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/08 00:06 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 5.84           | 8.76       | 2.92           | 50.02           | 10:31    |
| 2     | TOC                | 0.0000 | 0.0000 | 5.71           | 8.51       | 2.80           | 50.04           | 10:24    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)Sample Type: Check Standard --> CCV 25 ppm

From Schedule Version 73

| Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)      | Result             | Std. Dev.  | RSD | Start Time       |
|-----|-----|---------------------|-----|---------------------------|------------------------|--------------------|------------|-----|------------------|
| B   | TOC | 25.0000             | 1:2 | [TOC] CCV 25 ppm [25 ppm] | 0 / infinity (NA / NA) | 24.7687 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/08 00:34 |

| Pos | Base Analysis | ID | Rep | ppm | µg | Adjusted | NDIR | Baseline | Pressure | Run |
|-----|---------------|----|-----|-----|----|----------|------|----------|----------|-----|
|-----|---------------|----|-----|-----|----|----------|------|----------|----------|-----|



|   | Type |        | # |         |          |        |        |      |       | Time  |
|---|------|--------|---|---------|----------|--------|--------|------|-------|-------|
| B | TOC  | 25 ppm | 1 | 24.7687 | 247.6871 | 177.59 | 180.54 | 2.95 | 50.04 | 10:30 |

**Completion State**      **Success Action**      **Method**      **Calibration**      **STD Conc - Pos B**  
 Success - Criteria met.      Do Nothing      CAS\_salt\_010711 (v4)      CAS\_salt\_010711 (v30)      50 ppmC

**Sample Type:** Check Standard --> CCB

From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID         | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|-------------------|--------------------------|-------------------|------------|-----|------------------|
| ◆ | D   | TOC | 0.0000              | 1:1 | [TOC] CCB [0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/08 00:49 |

| Pos | Base Analysis Type | ID    | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|-------|-------|--------|--------|----------|------|----------|----------|----------|
| D   | TOC                | 0 ppm | 1     | 0.0000 | 0.0000 | 5.94     | 9.03 | 3.09     | 50.05    | 10:31    |

**Completion State**      **Success Action**      **Method**      **Calibration**      **STD Conc - Pos D**  
 Success - Criteria met.      Do Nothing      CAS\_salt\_010711 (v4)      CAS\_salt\_010711 (v30)      0 ppmC

**Sample Type:** Sample

From Schedule Version 73

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|---------|------------------|
| ◆ | 20  | TOC           | MB2       | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/08 01:03 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 6.15           | 9.21       | 3.06           | 50.06           | 10:32    |

**Dilution**      **Blank Contribution**      **Method**      **Calibration**  
 1:10      (TC) 8.7847 (IC) (v1253)      CAS\_salt\_010711 (v4)      CAS\_salt\_010711 (v30)

**Sample Type:** Check Standard --> LCS

From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID            | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|----------------------|--------------------------|--------------------|------------|-----|------------------|
| ◆ | C   | TOC | 25.0000             | 1:1 | [TOC] LCS [24.0 ppm] | 0 / infinity ( NA / NA ) | 25.0838 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/08 01:18 |

| Pos | Base Analysis Type | ID       | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|----------|-------|---------|----------|----------|--------|----------|----------|----------|
| C   | TOC                | 25.0 ppm | 1     | 25.0838 | 250.8382 | 179.73   | 182.56 | 2.83     | 50.06    | 10:30    |

**Completion State**      **Success Action**      **Method**      **Calibration**      **STD Conc - Pos C**  
 Success - Criteria met.      Do Nothing      CAS\_salt\_010711 (v4)      CAS\_salt\_010711 (v30)      25 ppmC

Sample Type: Sample

From Schedule Version 73

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 21  | TOC           | FB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/08 01:32 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 7.46           | 10.42      | 2.96           | 50.07           | 10:32    |

Dilution  
1:10

Blank Contribution  
(TC) 8.7847 (IC)  
(v1253)

Method  
CAS\_salt\_010711  
(v4)

Calibration  
CAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID           | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|---------------------|---------------|------------------|---------|------------------|
| 22  | TOC           | K1903899-001.01 doc | 0.5859 ppm    | 0.0156 ppm       | 2.6700% | 2019/05/08 01:47 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.5749 | 5.7489 | 12.69          | 15.55      | 2.86           | 50.07           | 10:28    |
| 2     | TOC                | 0.5970 | 5.9698 | 12.84          | 15.85      | 3.02           | 50.08           | 10:28    |

Dilution  
1:10

Blank Contribution  
(TC) 8.7847 (IC)  
(v1253)

Method  
CAS\_salt\_010711  
(v4)

Calibration  
CAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 23  | TOC           | K1903899-001.01 ms doc | 26.1881 ppm   | 0.0000 ppm       | 0.0000% | 2019/05/08 02:15 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 26.1881 | 261.8810 | 186.55         | 189.41     | 2.86           | 50.10           | 10:30    |

Dilution  
1:10

Blank Contribution  
(TC) 8.7847 (IC)  
(v1253)

Method  
CAS\_salt\_010711  
(v4)

Calibration  
CAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|-----------|---------------|------------------|---------|------------------|
| 24  | TOC           | RB        | 0.0000 ppm    | 0.0000 ppm       | 0.0000% | 2019/05/08 02:30 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.0000 | 0.0000 | 6.09           | 9.08       | 3.00           | 50.10           | 10:30    |

Dilution  
1:10

Blank Contribution  
(TC) 8.7847 (IC)  
(v1253)

Method  
CAS\_salt\_010711  
(v4)

Calibration  
CAS\_salt\_010711  
(v30)

| Pos | Analysis Type | Sample ID              | Result (ppmC) | Std. Dev. (ppmC) | RSD     | Start Time       |
|-----|---------------|------------------------|---------------|------------------|---------|------------------|
| 25  | TOC           | K1903899-002.01 doc 2x | 19.8648 ppm   | 0.1665 ppm       | 0.8400% | 2019/05/08 02:44 |

| Rep # | Base Analysis Type | ppm     | µg       | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|---------|----------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 19.9825 | 199.8254 | 144.42         | 147.36     | 2.94           | 50.10           | 10:28    |
| 2     | TOC                | 19.7471 | 197.4712 | 142.83         | 145.99     | 3.16           | 50.12           | 10:24    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)

|   | Pos | Analysis Type | Sample ID | Result (ppmC) | Std. Dev. (ppmC) | RSD       | Start Time       |
|---|-----|---------------|-----------|---------------|------------------|-----------|------------------|
| ♦ | 26  | TOC           | RB        | 0.0802 ppm    | 0.1134 ppm       | 141.4200% | 2019/05/08 03:13 |

| Rep # | Base Analysis Type | ppm    | µg     | Adjusted (Abs) | NDIR (Abs) | Baseline (Abs) | Pressure (psig) | Run Time |
|-------|--------------------|--------|--------|----------------|------------|----------------|-----------------|----------|
| 1     | TOC                | 0.1603 | 1.6033 | 9.87           | 12.85      | 2.98           | 50.14           | 10:28    |
| 2     | TOC                | 0.0000 | 0.0000 | 6.86           | 9.94       | 3.08           | 50.10           | 10:27    |

Dilution

1:10

Blank Contribution(TC) 8.7847 (IC)  
(v1253)MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)**Sample Type:** Check Standard --> CCV 25 ppm

From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID                 | Min / Max (% dev)        | Result             | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|---------------------------|--------------------------|--------------------|------------|-----|------------------|
| ♦ | B   | TOC | 25.0000             | 1:2 | [TOC] CCV 25 ppm [25 ppm] | 0 / infinity ( NA / NA ) | 24.6022 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/08 03:41 |

| Pos | Base Analysis Type | ID     | Rep # | ppm     | µg       | Adjusted | NDIR   | Baseline | Pressure | Run Time |
|-----|--------------------|--------|-------|---------|----------|----------|--------|----------|----------|----------|
| B   | TOC                | 25 ppm | 1     | 24.6022 | 246.0223 | 176.46   | 179.42 | 2.96     | 50.11    | 10:30    |

Completion State

Success - Criteria met.

Success Action

Do Nothing

MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)STD Conc - Pos B

50 ppmC

**Sample Type:** Check Standard --> CCB

From Schedule Version 73

|   | Pos | BAT | Concentration (ppm) | Dil | Sample ID         | Min / Max (% dev)        | Result            | Std. Dev.  | RSD | Start Time       |
|---|-----|-----|---------------------|-----|-------------------|--------------------------|-------------------|------------|-----|------------------|
| ♦ | D   | TOC | 0.0000              | 1:1 | [TOC] CCB [0 ppm] | 0 / infinity ( NA / NA ) | 0.0000 ppm (PASS) | 0.0000 ppm | 0%  | 2019/05/08 03:55 |

| Pos | Base Analysis Type | ID    | Rep # | ppm    | µg     | Adjusted | NDIR | Baseline | Pressure | Run Time |
|-----|--------------------|-------|-------|--------|--------|----------|------|----------|----------|----------|
| D   | TOC                | 0 ppm | 1     | 0.0000 | 0.0000 | 6.27     | 9.28 | 3.01     | 50.14    | 10:32    |

Completion State

Success - Criteria met.

Success Action

Do Nothing

MethodCAS\_salt\_010711  
(v4)CalibrationCAS\_salt\_010711  
(v30)STD Conc - Pos D

0 ppmC

**Meta Data Used in this Report**

**Blanks**

| Version | Reagent (Abs) | Acid (Abs) | DI IC (Abs) | DI TC (Abs) | DI TOC (Abs) | Save Time        | Operator          |
|---------|---------------|------------|-------------|-------------|--------------|------------------|-------------------|
| v1252   | 1.0447        | 0.7470     | 0.0000      | 0.0000      | 0.0000       | 2019/05/01 17:45 | Fusion1 (Fusion1) |
| v1253   | 1.3423        | 1.1900     | 0.0000      | 0.0000      | 0.0000       | 2019/05/07 15:06 | Fusion1 (Fusion1) |

**Calibrations****Name: CAS\_salt\_010711 (TOC)**

Version: v30 Calibration curve formula: TOC:  $y = 6.788x + 9.463$

Ver Creation: 2019/03/05 17:42  $r^2$  value: TOC:  $r^2 = 0.99963$

Comment:

Operator: Fusion1 (Fusion1)

Basic Analysis Type: TOC

**Basic Analysis Type: TOC**

| Sample ID | Y Raw Value | X Expected | Message | End Time         |
|-----------|-------------|------------|---------|------------------|
| DI Water  | 7.8970      | 0.0000     |         | 2019/03/05 16:15 |
| 0.500 ppm | 11.5280     | 0.5000     |         | 2019/03/05 16:29 |
| 1.0 ppm   | 14.9760     | 1.0000     |         | 2019/03/05 16:44 |
| 5.0 ppm   | 43.6500     | 5.0000     |         | 2019/03/05 16:58 |
| 10 ppm    | 79.6020     | 10.0000    |         | 2019/03/05 17:12 |
| 25 ppm    | 183.3580    | 25.0000    |         | 2019/03/05 17:26 |
| 50 ppm    | 346.3230    | 50.0000    |         | 2019/03/05 17:40 |

**Methods****Name: CAS\_salt\_010711 (TOC)**

Version: v4 Operator: Fusion1 (Fusion1)

Ver Creation: 2019/02/21 17:57

Comment:

| Parameter                  | Value      | Advanced Parameter    | Value      |
|----------------------------|------------|-----------------------|------------|
| SampleVolume               | 10.0 mL    | NeedleRinseVolume     | 5.0 ml     |
| Dilution                   | 1:10       | VialPrimeVolume       | 2.0 ml     |
| AcidVolume                 | 0.5 ml     | ICSamplePrimeVolume   | 2.0 ml     |
| ReagentVolume              | 2.0 ml     | ICSpurgeRinseVolume   | 12.0 ml    |
| UVReactorPrerinse          | Off        | BaselineStabilizeTime | 0.70 min   |
| UVReactorPrerinseVolume    | 5.0        | DetectorPressureFlow  | 150 ml/min |
| NumberOfUVReactorPrerinses | 1          | SyringeSpeedWaste     | 10         |
| ICSpurgeTime               | 1.00 mins  | SyringeSpeedAcid      | 7          |
| DetectorSweepFlow          | 500 ml/min | SyringeSpeedReagent   | 7          |
| PreSpurgeTime              | 2.00 mins  | SyringeSpeedDIWater   | 7          |
| SystemFlow                 | 500 ml/min | NDIRPressurization    | 60 psig    |

|                            |          |
|----------------------------|----------|
| SyringeSpeedSampleDispense | 5        |
| SyringeSpeedSampleAspirate | 4        |
| SyringeSpeedUVDispense     | 5        |
| SyringeSpeedUVAspirate     | 5        |
| SyringeSpeedICDispense     | 5        |
| SyringeSpeedICAspirate     | 5        |
| NDIRPressureStabilize      | 1.75 min |
| SampleMixing               | Off      |
| SampleMixingCycles         | 1        |
| SampleMixingVolume         | 10.0     |
| LowLevelFilterNDIR         | Off      |

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### Acceptance / Approval

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#### Electronic Signatures

| Report Version | User Name | Acceptance | Reason | Date |
|----------------|-----------|------------|--------|------|
|----------------|-----------|------------|--------|------|

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### Report History

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#### Report History

| Report Version | User Name         | System Reason      | User Reason        | Date             |
|----------------|-------------------|--------------------|--------------------|------------------|
| 1              | Fusion1 (Fusion1) | Schedule completed | Schedule completed | 2019/05/08 04:11 |

StarLIMS Run: 634658, 634659  
Analysis: TOC  
Method: 415.1, SM 5310 C, 9060, 9060A

CCV: 11-GEN-05-77K 50 ppm LCS: 11-GEN-05-77D 25.0 ppm

ICAL Date: 3/6/19

ICAL ID: 11-GEN-05-76H

ICS ID: 11-GEN-05-74A

ICS TV: 25.0 ppm ICS % R = 2

Spike ID: 11-GEN-05-77J 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-77M

21 % H<sub>3</sub>PO<sub>4</sub>: 11-GEN-05-77L

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, N11314F, Marge

FILTER ID: NA

|                             |                         |
|-----------------------------|-------------------------|
| Analyzed By: <i>Ed</i>      | Date Analyzed: 5/7/19   |
| Reviewed By: <i>Theresa</i> | Date Reviewed: 05/09/19 |



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10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
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May 15, 2019

Susan Huang  
Aptim Environmental & Infrastructure, Inc.  
2500 City West Blvd., Suite 1700  
Houston, TX 77042

Work Order: **HS19050304**

Laboratory Results for: **Longhorn Army Ammunition Plant LHAAP-67**

Dear Susan,

ALS Environmental received 10 sample(s) on May 04, 2019 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER

RJ Modashia  
Project Manager



## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**Work Order:** HS19050304

## SAMPLE SUMMARY

| Lab Samp ID   | Client Sample ID | Matrix      | TagNo | Collection Date   | Date Received     | Hold                     |
|---------------|------------------|-------------|-------|-------------------|-------------------|--------------------------|
| HS19050304-01 | 67WW14-190502    | Groundwater |       | 02-May-2019 09:15 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-02 | 67WW05-190502    | Groundwater |       | 02-May-2019 10:05 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-03 | 67WW12-190502    | Groundwater |       | 02-May-2019 11:00 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-04 | 67WW10-190502    | Groundwater |       | 02-May-2019 11:45 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-05 | 67WW09A-190502   | Groundwater |       | 02-May-2019 12:35 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-06 | 67WW01-190503    | Groundwater |       | 03-May-2019 08:10 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-07 | 67WW15-190503    | Groundwater |       | 03-May-2019 09:05 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-08 | 67WW09-190503    | Groundwater |       | 03-May-2019 09:50 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-09 | 67WW07-190503    | Groundwater |       | 03-May-2019 10:35 | 04-May-2019 08:55 | <input type="checkbox"/> |
| HS19050304-10 | TRIP BLANK       | Water       |       | 03-May-2019 00:00 | 04-May-2019 08:55 | <input type="checkbox"/> |

**ALS Houston, US**

Date: 15-May-19

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**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**Work Order:** HS19050304

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**CASE NARRATIVE**

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**GCMS Volatiles by Method SW8260****Batch ID: R338430**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.
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## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW14-190502  
 Collection Date: 02-May-2019 09:15

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-01  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|---|------------|----------------------|-------------|-------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                    | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,1,2-Trichloroethane                     | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| <b>1,1-Dichloroethane</b>                 | <b>1.4</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 16:50 |
| <b>1,1-Dichloroethene</b>                 | <b>5.3</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 16:50 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| <b>1,2-Dichloroethane</b>                 | <b>1.8</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 16:50 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| <b>Acetone</b>                            | <b>6.3</b> |                      | <b>0.40</b> | <b>1.0</b>  | <b>2.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 16:50 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 16:50 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW14-190502  
 Collection Date: 02-May-2019 09:15

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-01  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 16:50        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.8</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 16:50</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.2</i> |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 16:50</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>89.3</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 16:50</i> |
| <i>Surr: Toluene-d8</i>             | <i>106</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 16:50</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW05-190502  
 Collection Date: 02-May-2019 10:05

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-02  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |            |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1,2-Trichloroethane                     | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1-Dichloroethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1-Dichloroethene                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2-Dichloroethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 17:14 |
| <b>Acetone</b>                            | <b>3.8</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1               | 14-May-2019 17:14 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 17:14 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW05-190502  
 Collection Date: 02-May-2019 10:05

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-02  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:14        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>87.6</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:14</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>97.0</i> |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:14</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>89.3</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:14</i> |
| <i>Surr: Toluene-d8</i>             | <i>107</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:14</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW12-190502  
 Collection Date: 02-May-2019 11:00

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-03  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|-------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |             |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |             |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,1-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| <b>1,1-Dichloroethene</b>            | <b>2.1</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 17:38 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Acetone                              | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1                  | 14-May-2019 17:38 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW12-190502  
 Collection Date: 02-May-2019 11:00

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-03  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 17:38        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>87.9</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:38</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>102</i>  |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:38</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>88.3</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:38</i> |
| <i>Surr: Toluene-d8</i>             | <i>101</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 17:38</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW10-190502  
 Collection Date: 02-May-2019 11:45

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-04  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |            |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |            |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1-Dichloroethene                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| <b>Acetone</b>                       | <b>7.8</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 18:02 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:02 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW10-190502  
 Collection Date: 02-May-2019 11:45

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-04  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:02        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>88.6</i> |                      |      | <b>0</b> | <i>81-118</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:02</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.4</i> |                      |      | <b>0</b> | <i>85-114</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:02</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>88.1</i> |                      |      | <b>0</b> | <i>80-119</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:02</i> |
| <i>Surr: Toluene-d8</i>             | <i>103</i>  |                      |      | <b>0</b> | <i>89-112</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:02</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW09A-190502  
 Collection Date: 02-May-2019 12:35

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-05  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |            |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |            |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1-Dichloroethene                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| <b>Acetone</b>                       | <b>5.0</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 13:14 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 13:14 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW09A-190502  
 Collection Date: 02-May-2019 12:35

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-05  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 13:14        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>87.9</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 13:14</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.6</i> |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 13:14</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>90.2</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 13:14</i> |
| <i>Surr: Toluene-d8</i>             | <i>102</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <b>1</b>           | <i>14-May-2019 13:14</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW01-190503  
 Collection Date: 03-May-2019 08:10

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-06  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL | DL                   | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|------|----------------------|-------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            |      | <b>Method:SW8260</b> |             |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,1,1-Trichloroethane                     | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| <b>1,1,2-Trichloroethane</b>              | <b>1.4</b> |      | <b>0.30</b>          | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 13:38 |
| <b>1,1-Dichloroethane</b>                 | <b>12</b>  |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 13:38 |
| <b>1,1-Dichloroethene</b>                 | <b>280</b> |      | <b>1.0</b>           | <b>2.5</b>  | <b>5.0</b> | <b>UG/L</b> | 5               | 14-May-2019 15:14 |
| 1,1-Dichloropropene                       | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2,3-Trichloropropane                    | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2-Dibromoethane                         | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,2-Dichlorobenzene                       | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| <b>1,2-Dichloroethane</b>                 | <b>21</b>  |      | <b>0.20</b>          | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 13:38 |
| 1,2-Dichloropropane                       | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,3-Dichlorobenzene                       | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,3-Dichloropropane                       | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 1,4-Dichlorobenzene                       | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 2,2-Dichloropropane                       | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 2-Butanone                                | 1.0        | U    | 0.50                 | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 2-Chlorotoluene                           | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 2-Hexanone                                | 1.0        | U    | 1.0                  | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 4-Chlorotoluene                           | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 4-Isopropyltoluene                        | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| 4-Methyl-2-pentanone                      | 1.0        | U    | 0.70                 | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Acetone                                   | 1.0        | U    | 0.40                 | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Benzene                                   | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Bromobenzene                              | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Bromochloromethane                        | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Bromodichloromethane                      | 0.50       | U    | 0.20                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Bromoform                                 | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Bromomethane                              | 0.50       | U    | 0.40                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Carbon disulfide                          | 1.0        | U    | 0.60                 | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Carbon tetrachloride                      | 0.50       | U    | 0.50                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Chlorobenzene                             | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |
| Chloroethane                              | 0.50       | U    | 0.30                 | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 13:38 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW01-190503  
 Collection Date: 03-May-2019 08:10

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-06  
 Matrix:Groundwater

| ANALYSES                                  | RESULT      | QUAL                 | DL          | LOD         | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|---|-------------|----------------------|-------------|-------------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |             | <b>Method:SW8260</b> |             |             |               |             |                    | Analyst: PC              |
| Chloroform                                | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Chloromethane                             | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| <b>cis-1,2-Dichloroethene</b>             | <b>0.86</b> | J                    | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | 1                  | 14-May-2019 13:38        |
| cis-1,3-Dichloropropene                   | 0.50        | U                    | 0.10        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Dibromochloromethane                      | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Dibromomethane                            | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Dichlorodifluoromethane                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Ethylbenzene                              | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Hexachlorobutadiene                       | 1.0         | U                    | 1.0         | 1.0         | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Isopropylbenzene                          | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| m,p-Xylene                                | 1.0         | U                    | 0.50        | 1.0         | 2.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Methylene chloride                        | 1.0         | U                    | 0.40        | 1.0         | 2.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| n-Butylbenzene                            | 0.50        | U                    | 0.40        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| n-Propylbenzene                           | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Naphthalene                               | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| o-Xylene                                  | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| sec-Butylbenzene                          | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Styrene                                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| tert-Butylbenzene                         | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Tetrachloroethene                         | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| Toluene                                   | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| trans-1,2-Dichloroethene                  | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| trans-1,3-Dichloropropene                 | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| <b>Trichloroethene</b>                    | <b>1.3</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | 1                  | 14-May-2019 13:38        |
| Trichlorofluoromethane                    | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 13:38        |
| <b>Vinyl chloride</b>                     | <b>0.92</b> | J                    | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | 1                  | 14-May-2019 13:38        |
| <i>Surr: 1,2-Dichloroethane-d4</i>        | <i>86.1</i> |                      |             | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 13:38</i> |
| <i>Surr: 1,2-Dichloroethane-d4</i>        | <i>88.6</i> |                      |             | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:14</i> |
| <i>Surr: 4-Bromofluorobenzene</i>         | <i>99.9</i> |                      |             | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 13:38</i> |
| <i>Surr: 4-Bromofluorobenzene</i>         | <i>99.2</i> |                      |             | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:14</i> |
| <i>Surr: Dibromofluoromethane</i>         | <i>89.5</i> |                      |             | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 13:38</i> |
| <i>Surr: Dibromofluoromethane</i>         | <i>88.2</i> |                      |             | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:14</i> |
| <i>Surr: Toluene-d8</i>                   | <i>105</i>  |                      |             | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 13:38</i> |
| <i>Surr: Toluene-d8</i>                   | <i>104</i>  |                      |             | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:14</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW15-190503  
 Collection Date: 03-May-2019 09:05

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-07  
 Matrix:Groundwater

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD         | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|-------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |             |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| <b>1,1,2-Trichloroethane</b>              | <b>5.4</b> |                      | <b>0.30</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 14:02 |
| <b>1,1-Dichloroethane</b>                 | <b>9.2</b> |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 14:02 |
| <b>1,1-Dichloroethene</b>                 | <b>330</b> |                      | <b>1.0</b>  | <b>2.5</b>  | <b>5.0</b> | <b>UG/L</b> | 5               | 14-May-2019 15:38 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| <b>1,2-Dichloroethane</b>                 | <b>22</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b> | <b>UG/L</b> | 1               | 14-May-2019 14:02 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Acetone                                   | 1.0        | U                    | 0.40        | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0         | 2.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50        | 1.0        | UG/L        | 1               | 14-May-2019 14:02 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW15-190503  
 Collection Date: 03-May-2019 09:05

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-07  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL          | LOD         | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|-------------|-------------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |             |             |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |             |             |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Chloromethane                       | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| <b>cis-1,2-Dichloroethene</b>       | <b>1.3</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | 1                  | 14-May-2019 14:02        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Dibromochloromethane                | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Dibromomethane                      | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Ethylbenzene                        | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0         | 1.0         | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| m,p-Xylene                          | 1.0         | U                    | 0.50        | 1.0         | 2.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Methylene chloride                  | 1.0         | U                    | 0.40        | 1.0         | 2.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Naphthalene                         | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| o-Xylene                            | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Styrene                             | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Toluene                             | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| <b>Trichloroethene</b>              | <b>1.1</b>  |                      | <b>0.20</b> | <b>0.50</b> | <b>1.0</b>    | <b>UG/L</b> | 1                  | 14-May-2019 14:02        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| Vinyl chloride                      | 0.50        | U                    | 0.20        | 0.50        | 1.0           | UG/L        | 1                  | 14-May-2019 14:02        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>89.3</i> |                      |             | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 14:02</i> |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>88.0</i> |                      |             | <b>0</b>    | <i>81-118</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:38</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>100</i>  |                      |             | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 14:02</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>101</i>  |                      |             | <b>0</b>    | <i>85-114</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:38</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>91.0</i> |                      |             | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 14:02</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>89.0</i> |                      |             | <b>0</b>    | <i>80-119</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:38</i> |
| <i>Surr: Toluene-d8</i>             | <i>104</i>  |                      |             | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <i>5</i>           | <i>14-May-2019 15:38</i> |
| <i>Surr: Toluene-d8</i>             | <i>107</i>  |                      |             | <b>0</b>    | <i>89-112</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 14:02</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW09-190503  
 Collection Date: 03-May-2019 09:50

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-08  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |            |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |            |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1-Dichloroethene                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| <b>Acetone</b>                       | <b>3.2</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 18:26 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:26 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW09-190503  
 Collection Date: 03-May-2019 09:50

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-08  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:26        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.0</i> |                      |      | <b>0</b> | <i>81-118</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:26</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>98.7</i> |                      |      | <b>0</b> | <i>85-114</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:26</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>88.3</i> |                      |      | <b>0</b> | <i>80-119</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:26</i> |
| <i>Surr: Toluene-d8</i>             | <i>104</i>  |                      |      | <b>0</b> | <i>89-112</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:26</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW07-190503  
 Collection Date: 03-May-2019 10:35

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-09  
 Matrix:Groundwater

| ANALYSES                             | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED  |
|--------------------------------------|------------|----------------------|-------------|------------|------------|-------------|--------------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD</b>  |            | <b>Method:SW8260</b> |             |            |            |             |                    | Analyst: PC       |
| <b>8260C</b>                         |            |                      |             |            |            |             |                    |                   |
| 1,1,1,2-Tetrachloroethane            | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1,1-Trichloroethane                | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1,2,2-Tetrachloroethane            | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1,2-Trichloroethane                | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1-Dichloroethene                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,1-Dichloropropene                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2,3-Trichlorobenzene               | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2,3-Trichloropropane               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2,4-Trichlorobenzene               | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2,4-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2-Dibromo-3-chloropropane          | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2-Dibromoethane                    | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2-Dichlorobenzene                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2-Dichloroethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,2-Dichloropropane                  | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,3,5-Trimethylbenzene               | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,3-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,3-Dichloropropane                  | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 1,4-Dichlorobenzene                  | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 2,2-Dichloropropane                  | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 2-Butanone                           | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 2-Chlorotoluene                      | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 2-Hexanone                           | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 4-Chlorotoluene                      | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 4-Isopropyltoluene                   | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| 4-Methyl-2-pentanone                 | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| <b>Acetone</b>                       | <b>5.1</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1                  | 14-May-2019 18:50 |
| Benzene                              | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Bromobenzene                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Bromochloromethane                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Bromodichloromethane                 | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Bromoform                            | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Bromomethane                         | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Carbon disulfide                     | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Carbon tetrachloride                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Chlorobenzene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |
| Chloroethane                         | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1                  | 14-May-2019 18:50 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: 67WW07-190503  
 Collection Date: 03-May-2019 10:35

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-09  
 Matrix:Groundwater

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 18:50        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>86.8</i> |                      |      | <b>0</b> | <i>81-118</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:50</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>99.5</i> |                      |      | <b>0</b> | <i>85-114</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:50</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>87.7</i> |                      |      | <b>0</b> | <i>80-119</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:50</i> |
| <i>Surr: Toluene-d8</i>             | <i>103</i>  |                      |      | <b>0</b> | <i>89-112</i> | <i>%REC</i> | <i>1</i>           | <i>14-May-2019 18:50</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: TRIP BLANK  
 Collection Date: 03-May-2019 00:00

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-10  
 Matrix:Water

| ANALYSES                                  | RESULT     | QUAL                 | DL          | LOD        | LOQ        | UNITS       | DILUTION FACTOR | DATE ANALYZED     |
|---|------------|----------------------|-------------|------------|------------|-------------|-----------------|-------------------|
| <b>VOLATILES ORGANICS BY METHOD 8260C</b> |            | <b>Method:SW8260</b> |             |            |            |             |                 | Analyst: PC       |
| 1,1,1,2-Tetrachloroethane                 | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1,1-Trichloroethane                     | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1,2,2-Tetrachloroethane                 | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1,2-Trichlor-1,2,2-trifluoroethane      | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1,2-Trichloroethane                     | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1-Dichloroethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1-Dichloroethene                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,1-Dichloropropene                       | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2,3-Trichlorobenzene                    | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2,3-Trichloropropane                    | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2,4-Trichlorobenzene                    | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2,4-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2-Dibromo-3-chloropropane               | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2-Dibromoethane                         | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2-Dichlorobenzene                       | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2-Dichloroethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,2-Dichloropropane                       | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,3,5-Trimethylbenzene                    | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,3-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,3-Dichloropropane                       | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 1,4-Dichlorobenzene                       | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 2,2-Dichloropropane                       | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 2-Butanone                                | 1.0        | U                    | 0.50        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 2-Chlorotoluene                           | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 2-Hexanone                                | 1.0        | U                    | 1.0         | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 4-Chlorotoluene                           | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 4-Isopropyltoluene                        | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| 4-Methyl-2-pentanone                      | 1.0        | U                    | 0.70        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 12:25 |
| <b>Acetone</b>                            | <b>4.2</b> |                      | <b>0.40</b> | <b>1.0</b> | <b>2.0</b> | <b>UG/L</b> | 1               | 14-May-2019 12:25 |
| Benzene                                   | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Bromobenzene                              | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Bromochloromethane                        | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Bromodichloromethane                      | 0.50       | U                    | 0.20        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Bromoform                                 | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Bromomethane                              | 0.50       | U                    | 0.40        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Carbon disulfide                          | 1.0        | U                    | 0.60        | 1.0        | 2.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Carbon tetrachloride                      | 0.50       | U                    | 0.50        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Chlorobenzene                             | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |
| Chloroethane                              | 0.50       | U                    | 0.30        | 0.50       | 1.0        | UG/L        | 1               | 14-May-2019 12:25 |

Note: See Qualifiers Page for a list of qualifiers and their explanation.



## ALS Houston, US

Date: 15-May-19

Client: Aptim Environmental & Infrastructure, Inc.  
 Project: Longhorn Army Ammunition Plant LHAAP-67  
 Sample ID: TRIP BLANK  
 Collection Date: 03-May-2019 00:00

## ANALYTICAL REPORT

WorkOrder:HS19050304  
 Lab ID:HS19050304-10  
 Matrix:Water

| ANALYSES                            | RESULT      | QUAL                 | DL   | LOD      | LOQ           | UNITS       | DILUTION<br>FACTOR | DATE<br>ANALYZED         |
|-------------------------------------|-------------|----------------------|------|----------|---------------|-------------|--------------------|--------------------------|
| <b>VOLATILES ORGANICS BY METHOD</b> |             | <b>Method:SW8260</b> |      |          |               |             |                    | Analyst: PC              |
| <b>8260C</b>                        |             |                      |      |          |               |             |                    |                          |
| Chloroform                          | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Chloromethane                       | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| cis-1,2-Dichloroethene              | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| cis-1,3-Dichloropropene             | 0.50        | U                    | 0.10 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Dibromochloromethane                | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Dibromomethane                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Dichlorodifluoromethane             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Ethylbenzene                        | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Hexachlorobutadiene                 | 1.0         | U                    | 1.0  | 1.0      | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Isopropylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| m,p-Xylene                          | 1.0         | U                    | 0.50 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Methylene chloride                  | 1.0         | U                    | 0.40 | 1.0      | 2.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| n-Butylbenzene                      | 0.50        | U                    | 0.40 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| n-Propylbenzene                     | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Naphthalene                         | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| o-Xylene                            | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| sec-Butylbenzene                    | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Styrene                             | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| tert-Butylbenzene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Tetrachloroethene                   | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Toluene                             | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| trans-1,2-Dichloroethene            | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| trans-1,3-Dichloropropene           | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Trichloroethene                     | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Trichlorofluoromethane              | 0.50        | U                    | 0.30 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| Vinyl chloride                      | 0.50        | U                    | 0.20 | 0.50     | 1.0           | UG/L        | 1                  | 14-May-2019 12:25        |
| <i>Surr: 1,2-Dichloroethane-d4</i>  | <i>88.0</i> |                      |      | <b>0</b> | <i>81-118</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 12:25</i> |
| <i>Surr: 4-Bromofluorobenzene</i>   | <i>101</i>  |                      |      | <b>0</b> | <i>85-114</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 12:25</i> |
| <i>Surr: Dibromofluoromethane</i>   | <i>90.3</i> |                      |      | <b>0</b> | <i>80-119</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 12:25</i> |
| <i>Surr: Toluene-d8</i>             | <i>103</i>  |                      |      | <b>0</b> | <i>89-112</i> | <b>%REC</b> | <i>1</i>           | <i>14-May-2019 12:25</i> |

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**DATES REPORT**

| Sample ID               | Client Samp ID  | Collection Date   | TCLP Date | Prep Date                  | Analysis Date     | DF |
|-------------------------|---|-------------------|-----------|----------------------------|-------------------|----|
| <b>Batch ID</b> R338430 | <b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C |                   |           | <b>Matrix:</b> Water       |                   |    |
| HS19050304-10           | TRIP BLANK  | 03 May 2019 00:00 |           |                            | 14 May 2019 12:25 | 1  |
| <b>Batch ID</b> R338430 | <b>Test Name :</b> VOLATILES ORGANICS BY METHOD 8260C |                   |           | <b>Matrix:</b> Groundwater |                   |    |
| HS19050304-01           | 67WW14-190502   | 02 May 2019 09:15 |           |                            | 14 May 2019 16:50 | 1  |
| HS19050304-02           | 67WW05-190502   | 02 May 2019 10:05 |           |                            | 14 May 2019 17:14 | 1  |
| HS19050304-03           | 67WW12-190502   | 02 May 2019 11:00 |           |                            | 14 May 2019 17:38 | 1  |
| HS19050304-04           | 67WW10-190502   | 02 May 2019 11:45 |           |                            | 14 May 2019 18:02 | 1  |
| HS19050304-05           | 67WW09A-190502  | 02 May 2019 12:35 |           |                            | 14 May 2019 13:14 | 1  |
| HS19050304-06           | 67WW01-190503   | 03 May 2019 08:10 |           |                            | 14 May 2019 15:14 | 5  |
| HS19050304-06           | 67WW01-190503   | 03 May 2019 08:10 |           |                            | 14 May 2019 13:38 | 1  |
| HS19050304-07           | 67WW15-190503   | 03 May 2019 09:05 |           |                            | 14 May 2019 15:38 | 5  |
| HS19050304-07           | 67WW15-190503   | 03 May 2019 09:05 |           |                            | 14 May 2019 14:02 | 1  |
| HS19050304-08           | 67WW09-190503   | 03 May 2019 09:50 |           |                            | 14 May 2019 18:26 | 1  |
| HS19050304-09           | 67WW07-190503   | 03 May 2019 10:35 |           |                            | 14 May 2019 18:50 | 1  |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )              |                         | Instrument: VOA6 |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |               |               |      |           |      |
|--------------------------------------|-------------------------|------------------|---------|--|------|---------------|---------------|------|-----------|------|
| <b>MBLK</b>                          | Sample ID: VBLKW-190514 | Units: UG/L      |         | Analysis Date: 14-May-2019 11:37           |      |               |               |      |           |      |
| Client ID:                           | Run ID: VOA6_338430     | SeqNo: 5075195   |         | PrepDate:                                  |      | DF: 1         |               |      |           |      |
| Analyte                              | Result                  | PQL              | SPK Val | SPK Ref Value                              | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| 1,1,1,2-Tetrachloroethane            | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1,1-Trichloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1,2,2-Tetrachloroethane            | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1,2-Trichloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1-Dichloroethane                   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1-Dichloroethene                   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,1-Dichloropropene                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2,3-Trichlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2,3-Trichloropropane               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2,4-Trichlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2,4-Trimethylbenzene               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2-Dibromo-3-chloropropane          | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2-Dibromoethane                    | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2-Dichloroethane                   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,2-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,3,5-Trimethylbenzene               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,3-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,3-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 1,4-Dichlorobenzene                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 2,2-Dichloropropane                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 2-Butanone                           | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| 2-Chlorotoluene                      | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 2-Hexanone                           | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| 4-Chlorotoluene                      | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 4-Isopropyltoluene                   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| 4-Methyl-2-pentanone                 | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| Acetone                              | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| Benzene                              | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Bromobenzene                         | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Bromochloromethane                   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Bromodichloromethane                 | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Bromoform                            | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )     |                         | Instrument: VOA6 |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |               |               |      |           |      |
|-----------------------------|-------------------------|------------------|---------|--|------|---------------|---------------|------|-----------|------|
| <b>MBLK</b>                 | Sample ID: VBLKW-190514 | Units: UG/L      |         | Analysis Date: 14-May-2019 11:37           |      |               |               |      |           |      |
| Client ID:                  | Run ID: VOA6_338430     | SeqNo: 5075195   |         | PrepDate:                                  |      | DF: 1         |               |      |           |      |
| Analyte                     | Result                  | PQL              | SPK Val | SPK Ref Value                              | %REC | Control Limit | RPD Ref Value | %RPD | RPD Limit | Qual |
| Bromomethane                | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Carbon disulfide            | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| Carbon tetrachloride        | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Chlorobenzene               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Chloroethane                | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Chloroform                  | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Chloromethane               | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| cis-1,2-Dichloroethene      | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| cis-1,3-Dichloropropene     | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Dibromochloromethane        | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Dibromomethane              | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Dichlorodifluoromethane     | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Ethylbenzene                | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Hexachlorobutadiene         | 1.0                     | 1.0              |         |  |      |               |               |      |           | U    |
| Isopropylbenzene            | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| m,p-Xylene                  | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| Methylene chloride          | 1.0                     | 2.0              |         |  |      |               |               |      |           | U    |
| Naphthalene                 | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| n-Butylbenzene              | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| n-Propylbenzene             | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| o-Xylene                    | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| sec-Butylbenzene            | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Styrene                     | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| tert-Butylbenzene           | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Tetrachloroethene           | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Toluene                     | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| trans-1,2-Dichloroethene    | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| trans-1,3-Dichloropropene   | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Trichloroethene             | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Trichlorofluoromethane      | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Vinyl chloride              | 0.50                    | 1.0              |         |  |      |               |               |      |           | U    |
| Surr: 1,2-Dichloroethane-d4 | 42.59                   | 1.0              | 50      | 0  | 85.2 | 81 - 118      |               |      |           |      |
| Surr: 4-Bromofluorobenzene  | 48.97                   | 1.0              | 50      | 0  | 97.9 | 85 - 114      |               |      |           |      |
| Surr: Dibromofluoromethane  | 43.89                   | 1.0              | 50      | 0  | 87.8 | 80 - 119      |               |      |           |      |

ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**QC BATCH REPORT**

| Batch ID: R338430 ( 0 ) |                                | Instrument: VOA6   |                       | Method: VOLATILES ORGANICS BY METHOD 8260C |            |                 |               |      |                |
|-------------------------|--------------------------------|--------------------|-----------------------|--|------------|-----------------|---------------|------|----------------|
| <b>MBLK</b>             | Sample ID: <b>VBLKW-190514</b> | Units: <b>UG/L</b> |                       | Analysis Date: <b>14-May-2019 11:37</b>    |            |                 |               |      |                |
| Client ID:              | Run ID: <b>VOA6_338430</b>     |                    | SeqNo: <b>5075195</b> |  | PrepDate:  |                 | DF: <b>1</b>  |      |                |
| Analyte                 | Result                         | PQL                | SPK Val               | SPK Ref Value                              | %REC       | Control Limit   | RPD Ref Value | %RPD | RPD Limit Qual |
| <i>Surr: Toluene-d8</i> | <i>52.89</i>                   | <i>1.0</i>         | <i>50</i>             | <i>0</i>                                   | <i>106</i> | <i>89 - 112</i> |               |      |                |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )              |        | Instrument: VOA6        |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|--------------------------------------|--------|-------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| LCS                                  |        | Sample ID: VLCSW-190514 |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 10:49 |               |       |                |
| Client ID:                           |        | Run ID: VOA6_338430     |         | SeqNo: 5075194                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                              | Result | PQL                     | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 19.65  | 1.0                     | 20      | 0  | 98.3 | 78 - 124                         |               |       |                |
| 1,1,1-Trichloroethane                | 19.21  | 1.0                     | 20      | 0  | 96.0 | 74 - 131                         |               |       |                |
| 1,1,2,2-Tetrachloroethane            | 19.94  | 1.0                     | 20      | 0  | 99.7 | 71 - 121                         |               |       |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 20.17  | 1.0                     | 20      | 0  | 101  | 70 - 136                         |               |       |                |
| 1,1,2-Trichloroethane                | 19.79  | 1.0                     | 20      | 0  | 98.9 | 80 - 119                         |               |       |                |
| 1,1-Dichloroethane                   | 19.1   | 1.0                     | 20      | 0  | 95.5 | 77 - 125                         |               |       |                |
| 1,1-Dichloroethene                   | 19.64  | 1.0                     | 20      | 0  | 98.2 | 71 - 131                         |               |       |                |
| 1,1-Dichloropropene                  | 19.1   | 1.0                     | 20      | 0  | 95.5 | 78 - 125                         |               |       |                |
| 1,2,3-Trichlorobenzene               | 22.8   | 1.0                     | 20      | 0  | 114  | 69 - 129                         |               |       |                |
| 1,2,3-Trichloropropane               | 19.99  | 1.0                     | 20      | 0  | 99.9 | 73 - 122                         |               |       |                |
| 1,2,4-Trichlorobenzene               | 20.95  | 1.0                     | 20      | 0  | 105  | 69 - 130                         |               |       |                |
| 1,2,4-Trimethylbenzene               | 19.27  | 1.0                     | 20      | 0  | 96.3 | 76 - 124                         |               |       |                |
| 1,2-Dibromo-3-chloropropane          | 20.82  | 1.0                     | 20      | 0  | 104  | 62 - 128                         |               |       |                |
| 1,2-Dibromoethane                    | 19.76  | 1.0                     | 20      | 0  | 98.8 | 77 - 121                         |               |       |                |
| 1,2-Dichlorobenzene                  | 19.39  | 1.0                     | 20      | 0  | 96.9 | 80 - 119                         |               |       |                |
| 1,2-Dichloroethane                   | 19.2   | 1.0                     | 20      | 0  | 96.0 | 73 - 128                         |               |       |                |
| 1,2-Dichloropropane                  | 20.1   | 1.0                     | 20      | 0  | 100  | 78 - 122                         |               |       |                |
| 1,3,5-Trimethylbenzene               | 19.23  | 1.0                     | 20      | 0  | 96.2 | 75 - 124                         |               |       |                |
| 1,3-Dichlorobenzene                  | 19.33  | 1.0                     | 20      | 0  | 96.7 | 80 - 119                         |               |       |                |
| 1,3-Dichloropropane                  | 19.66  | 1.0                     | 20      | 0  | 98.3 | 80 - 119                         |               |       |                |
| 1,4-Dichlorobenzene                  | 19.64  | 1.0                     | 20      | 0  | 98.2 | 79 - 118                         |               |       |                |
| 2,2-Dichloropropane                  | 19.71  | 1.0                     | 20      | 0  | 98.6 | 60 - 139                         |               |       |                |
| 2-Butanone                           | 41.52  | 2.0                     | 40      | 0  | 104  | 56 - 143                         |               |       |                |
| 2-Chlorotoluene                      | 18.51  | 1.0                     | 20      | 0  | 92.5 | 79 - 122                         |               |       |                |
| 2-Hexanone                           | 40.58  | 2.0                     | 40      | 0  | 101  | 57 - 139                         |               |       |                |
| 4-Chlorotoluene                      | 18.69  | 1.0                     | 20      | 0  | 93.4 | 78 - 122                         |               |       |                |
| 4-Isopropyltoluene                   | 18.93  | 1.0                     | 20      | 0  | 94.6 | 77 - 127                         |               |       |                |
| 4-Methyl-2-pentanone                 | 39.72  | 2.0                     | 40      | 0  | 99.3 | 67 - 130                         |               |       |                |
| Acetone                              | 44.55  | 2.0                     | 40      | 0  | 111  | 39 - 160                         |               |       |                |
| Benzene                              | 19.69  | 1.0                     | 20      | 0  | 98.4 | 79 - 120                         |               |       |                |
| Bromobenzene                         | 19.68  | 1.0                     | 20      | 0  | 98.4 | 80 - 120                         |               |       |                |
| Bromochloromethane                   | 19.96  | 1.0                     | 20      | 0  | 99.8 | 78 - 123                         |               |       |                |
| Bromodichloromethane                 | 20.01  | 1.0                     | 20      | 0  | 100  | 79 - 125                         |               |       |                |
| Bromoform                            | 21     | 1.0                     | 20      | 0  | 105  | 66 - 130                         |               |       |                |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )     |        | Instrument: VOA6        |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|-------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| LCS                         |        | Sample ID: VLCSW-190514 |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 10:49 |               |       |                |
| Client ID:                  |        | Run ID: VOA6_338430     |         | SeqNo: 5075194                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                     | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 22.76  | 1.0                     | 20      | 0  | 114  | 53 - 141                         |               |       |                |
| Carbon disulfide            | 39.51  | 2.0                     | 40      | 0  | 98.8 | 64 - 133                         |               |       |                |
| Carbon tetrachloride        | 18.82  | 1.0                     | 20      | 0  | 94.1 | 72 - 136                         |               |       |                |
| Chlorobenzene               | 19.91  | 1.0                     | 20      | 0  | 99.5 | 82 - 118                         |               |       |                |
| Chloroethane                | 18.27  | 1.0                     | 20      | 0  | 91.3 | 60 - 138                         |               |       |                |
| Chloroform                  | 19.45  | 1.0                     | 20      | 0  | 97.2 | 79 - 124                         |               |       |                |
| Chloromethane               | 18.59  | 1.0                     | 20      | 0  | 93.0 | 50 - 139                         |               |       |                |
| cis-1,2-Dichloroethene      | 19.06  | 1.0                     | 20      | 0  | 95.3 | 78 - 123                         |               |       |                |
| cis-1,3-Dichloropropene     | 20.18  | 1.0                     | 20      | 0  | 101  | 75 - 124                         |               |       |                |
| Dibromochloromethane        | 19.83  | 1.0                     | 20      | 0  | 99.2 | 74 - 126                         |               |       |                |
| Dibromomethane              | 20.15  | 1.0                     | 20      | 0  | 101  | 79 - 123                         |               |       |                |
| Dichlorodifluoromethane     | 21.17  | 1.0                     | 20      | 0  | 106  | 32 - 152                         |               |       |                |
| Ethylbenzene                | 19.47  | 1.0                     | 20      | 0  | 97.3 | 79 - 121                         |               |       |                |
| Hexachlorobutadiene         | 20.77  | 1.0                     | 20      | 0  | 104  | 66 - 134                         |               |       |                |
| Isopropylbenzene            | 19.15  | 1.0                     | 20      | 0  | 95.7 | 72 - 131                         |               |       |                |
| m,p-Xylene                  | 38.81  | 2.0                     | 40      | 0  | 97.0 | 80 - 121                         |               |       |                |
| Methylene chloride          | 20.12  | 2.0                     | 20      | 0  | 101  | 74 - 124                         |               |       |                |
| Naphthalene                 | 20.78  | 1.0                     | 20      | 0  | 104  | 61 - 128                         |               |       |                |
| n-Butylbenzene              | 19.23  | 1.0                     | 20      | 0  | 96.1 | 75 - 128                         |               |       |                |
| n-Propylbenzene             | 18.85  | 1.0                     | 20      | 0  | 94.2 | 76 - 126                         |               |       |                |
| o-Xylene                    | 19.46  | 1.0                     | 20      | 0  | 97.3 | 78 - 122                         |               |       |                |
| sec-Butylbenzene            | 18.62  | 1.0                     | 20      | 0  | 93.1 | 77 - 126                         |               |       |                |
| Styrene                     | 20.18  | 1.0                     | 20      | 0  | 101  | 78 - 123                         |               |       |                |
| tert-Butylbenzene           | 18.7   | 1.0                     | 20      | 0  | 93.5 | 78 - 124                         |               |       |                |
| Tetrachloroethene           | 19.22  | 1.0                     | 20      | 0  | 96.1 | 74 - 129                         |               |       |                |
| Toluene                     | 19.42  | 1.0                     | 20      | 0  | 97.1 | 80 - 121                         |               |       |                |
| trans-1,2-Dichloroethene    | 19.89  | 1.0                     | 20      | 0  | 99.5 | 75 - 124                         |               |       |                |
| trans-1,3-Dichloropropene   | 20.67  | 1.0                     | 20      | 0  | 103  | 73 - 127                         |               |       |                |
| Trichloroethene             | 19.92  | 1.0                     | 20      | 0  | 99.6 | 79 - 123                         |               |       |                |
| Trichlorofluoromethane      | 19.39  | 1.0                     | 20      | 0  | 96.9 | 65 - 141                         |               |       |                |
| Vinyl chloride              | 19.64  | 1.0                     | 20      | 0  | 98.2 | 58 - 137                         |               |       |                |
| Surr: 1,2-Dichloroethane-d4 | 49.83  | 1.0                     | 50      | 0  | 99.7 | 81 - 118                         |               |       |                |
| Surr: 4-Bromofluorobenzene  | 50.82  | 1.0                     | 50      | 0  | 102  | 85 - 114                         |               |       |                |
| Surr: Dibromofluoromethane  | 48.75  | 1.0                     | 50      | 0  | 97.5 | 80 - 119                         |               |       |                |



ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**QC BATCH REPORT**

| Batch ID: R338430 ( 0 ) |                                | Instrument: VOA6   |                       | Method: VOLATILES ORGANICS BY METHOD 8260C |             |                 |               |      |                |
|-------------------------|--------------------------------|--------------------|-----------------------|--|-------------|-----------------|---------------|------|----------------|
| <b>LCS</b>              | Sample ID: <b>VLCSW-190514</b> | Units: <b>UG/L</b> |                       | Analysis Date: <b>14-May-2019 10:49</b>    |             |                 |               |      |                |
| Client ID:              | Run ID: <b>VOA6_338430</b>     |                    | SeqNo: <b>5075194</b> |  | PrepDate:   |                 | DF: <b>1</b>  |      |                |
| Analyte                 | Result                         | PQL                | SPK Val               | SPK Ref Value                              | %REC        | Control Limit   | RPD Ref Value | %RPD | RPD Limit Qual |
| <i>Surr: Toluene-d8</i> | <i>48.69</i>                   | <i>1.0</i>         | <i>50</i>             | <i>0</i>                                   | <i>97.4</i> | <i>89 - 112</i> |               |      |                |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )              |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|--------------------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MS                                   |        | Sample ID: HS19050304-05MS |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 14:26 |               |       |                |
| Client ID: 67WW09A-190502            |        | Run ID: VOA6_338430        |         | SeqNo: 5075202                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                              | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 17.96  | 1.0                        | 20      | 0  | 89.8 | 78 - 124                         |               |       |                |
| 1,1,1-Trichloroethane                | 17.27  | 1.0                        | 20      | 0  | 86.4 | 74 - 131                         |               |       |                |
| 1,1,2,2-Tetrachloroethane            | 19.07  | 1.0                        | 20      | 0  | 95.4 | 71 - 121                         |               |       |                |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 19.02  | 1.0                        | 20      | 0  | 95.1 | 70 - 136                         |               |       |                |
| 1,1,2-Trichloroethane                | 18.35  | 1.0                        | 20      | 0  | 91.8 | 80 - 119                         |               |       |                |
| 1,1-Dichloroethane                   | 16.46  | 1.0                        | 20      | 0  | 82.3 | 77 - 125                         |               |       |                |
| 1,1-Dichloroethene                   | 17.19  | 1.0                        | 20      | 0  | 86.0 | 71 - 131                         |               |       |                |
| 1,1-Dichloropropene                  | 18.19  | 1.0                        | 20      | 0  | 91.0 | 78 - 125                         |               |       |                |
| 1,2,3-Trichlorobenzene               | 21.91  | 1.0                        | 20      | 0  | 110  | 69 - 129                         |               |       |                |
| 1,2,3-Trichloropropane               | 18.51  | 1.0                        | 20      | 0  | 92.6 | 73 - 122                         |               |       |                |
| 1,2,4-Trichlorobenzene               | 20.05  | 1.0                        | 20      | 0  | 100  | 69 - 130                         |               |       |                |
| 1,2,4-Trimethylbenzene               | 17.85  | 1.0                        | 20      | 0  | 89.3 | 76 - 124                         |               |       |                |
| 1,2-Dibromo-3-chloropropane          | 20.62  | 1.0                        | 20      | 0  | 103  | 62 - 128                         |               |       |                |
| 1,2-Dibromoethane                    | 18.37  | 1.0                        | 20      | 0  | 91.9 | 77 - 121                         |               |       |                |
| 1,2-Dichlorobenzene                  | 18.43  | 1.0                        | 20      | 0  | 92.2 | 80 - 119                         |               |       |                |
| 1,2-Dichloroethane                   | 16.81  | 1.0                        | 20      | 0  | 84.1 | 73 - 128                         |               |       |                |
| 1,2-Dichloropropane                  | 17.63  | 1.0                        | 20      | 0  | 88.2 | 78 - 122                         |               |       |                |
| 1,3,5-Trimethylbenzene               | 18.57  | 1.0                        | 20      | 0  | 92.8 | 75 - 124                         |               |       |                |
| 1,3-Dichlorobenzene                  | 18.44  | 1.0                        | 20      | 0  | 92.2 | 80 - 119                         |               |       |                |
| 1,3-Dichloropropane                  | 18.25  | 1.0                        | 20      | 0  | 91.3 | 80 - 119                         |               |       |                |
| 1,4-Dichlorobenzene                  | 18.41  | 1.0                        | 20      | 0  | 92.1 | 79 - 118                         |               |       |                |
| 2,2-Dichloropropane                  | 17.18  | 1.0                        | 20      | 0  | 85.9 | 60 - 139                         |               |       |                |
| 2-Butanone                           | 36.74  | 2.0                        | 40      | 0  | 91.9 | 56 - 143                         |               |       |                |
| 2-Chlorotoluene                      | 18.14  | 1.0                        | 20      | 0  | 90.7 | 79 - 122                         |               |       |                |
| 2-Hexanone                           | 36.41  | 2.0                        | 40      | 0  | 91.0 | 57 - 139                         |               |       |                |
| 4-Chlorotoluene                      | 18.02  | 1.0                        | 20      | 0  | 90.1 | 78 - 122                         |               |       |                |
| 4-Isopropyltoluene                   | 19.4   | 1.0                        | 20      | 0  | 97.0 | 77 - 127                         |               |       |                |
| 4-Methyl-2-pentanone                 | 37.53  | 2.0                        | 40      | 0  | 93.8 | 67 - 130                         |               |       |                |
| Acetone                              | 41.3   | 2.0                        | 40      | 5.033                                      | 90.7 | 39 - 160                         |               |       |                |
| Benzene                              | 17.22  | 1.0                        | 20      | 0  | 86.1 | 79 - 120                         |               |       |                |
| Bromobenzene                         | 17.54  | 1.0                        | 20      | 0  | 87.7 | 80 - 120                         |               |       |                |
| Bromochloromethane                   | 16.53  | 1.0                        | 20      | 0  | 82.6 | 78 - 123                         |               |       |                |
| Bromodichloromethane                 | 17.16  | 1.0                        | 20      | 0  | 85.8 | 79 - 125                         |               |       |                |
| Bromoform                            | 18.69  | 1.0                        | 20      | 0  | 93.5 | 66 - 130                         |               |       |                |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )     |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MS                          |        | Sample ID: HS19050304-05MS |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 14:26 |               |       |                |
| Client ID: 67WW09A-190502   |        | Run ID: VOA6_338430        |         | SeqNo: 5075202                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 14.83  | 1.0                        | 20      | 0  | 74.1 | 53 - 141                         |               |       |                |
| Carbon disulfide            | 34.64  | 2.0                        | 40      | 0  | 86.6 | 64 - 133                         |               |       |                |
| Carbon tetrachloride        | 17.45  | 1.0                        | 20      | 0  | 87.2 | 72 - 136                         |               |       |                |
| Chlorobenzene               | 18.68  | 1.0                        | 20      | 0  | 93.4 | 82 - 118                         |               |       |                |
| Chloroethane                | 16.04  | 1.0                        | 20      | 0  | 80.2 | 60 - 138                         |               |       |                |
| Chloroform                  | 16.36  | 1.0                        | 20      | 0  | 81.8 | 79 - 124                         |               |       |                |
| Chloromethane               | 14.06  | 1.0                        | 20      | 0  | 70.3 | 50 - 139                         |               |       |                |
| cis-1,2-Dichloroethene      | 16.27  | 1.0                        | 20      | 0  | 81.4 | 78 - 123                         |               |       |                |
| cis-1,3-Dichloropropene     | 18.73  | 1.0                        | 20      | 0  | 93.7 | 75 - 124                         |               |       |                |
| Dibromochloromethane        | 18.41  | 1.0                        | 20      | 0  | 92.0 | 74 - 126                         |               |       |                |
| Dibromomethane              | 17.7   | 1.0                        | 20      | 0  | 88.5 | 79 - 123                         |               |       |                |
| Dichlorodifluoromethane     | 15.98  | 1.0                        | 20      | 0  | 79.9 | 32 - 152                         |               |       |                |
| Ethylbenzene                | 18.41  | 1.0                        | 20      | 0  | 92.1 | 79 - 121                         |               |       |                |
| Hexachlorobutadiene         | 21.25  | 1.0                        | 20      | 0  | 106  | 66 - 134                         |               |       |                |
| Isopropylbenzene            | 18.73  | 1.0                        | 20      | 0  | 93.7 | 72 - 131                         |               |       |                |
| m,p-Xylene                  | 37.34  | 2.0                        | 40      | 0  | 93.4 | 80 - 121                         |               |       |                |
| Methylene chloride          | 16.74  | 2.0                        | 20      | 0  | 83.7 | 74 - 124                         |               |       |                |
| Naphthalene                 | 20.25  | 1.0                        | 20      | 0  | 101  | 61 - 128                         |               |       |                |
| n-Butylbenzene              | 19.47  | 1.0                        | 20      | 0  | 97.4 | 75 - 128                         |               |       |                |
| n-Propylbenzene             | 19.15  | 1.0                        | 20      | 0  | 95.8 | 76 - 126                         |               |       |                |
| o-Xylene                    | 19.15  | 1.0                        | 20      | 0  | 95.7 | 78 - 122                         |               |       |                |
| sec-Butylbenzene            | 19.76  | 1.0                        | 20      | 0  | 98.8 | 77 - 126                         |               |       |                |
| Styrene                     | 18.13  | 1.0                        | 20      | 0  | 90.7 | 78 - 123                         |               |       |                |
| tert-Butylbenzene           | 19.35  | 1.0                        | 20      | 0  | 96.8 | 78 - 124                         |               |       |                |
| Tetrachloroethene           | 18.9   | 1.0                        | 20      | 0  | 94.5 | 74 - 129                         |               |       |                |
| Toluene                     | 18.38  | 1.0                        | 20      | 0  | 91.9 | 80 - 121                         |               |       |                |
| trans-1,2-Dichloroethene    | 17.28  | 1.0                        | 20      | 0  | 86.4 | 75 - 124                         |               |       |                |
| trans-1,3-Dichloropropene   | 17.81  | 1.0                        | 20      | 0  | 89.1 | 73 - 127                         |               |       |                |
| Trichloroethene             | 18.37  | 1.0                        | 20      | 0  | 91.9 | 79 - 123                         |               |       |                |
| Trichlorofluoromethane      | 16.85  | 1.0                        | 20      | 0  | 84.3 | 65 - 141                         |               |       |                |
| Vinyl chloride              | 17.11  | 1.0                        | 20      | 0  | 85.5 | 58 - 137                         |               |       |                |
| Surr: 1,2-Dichloroethane-d4 | 43.63  | 1.0                        | 50      | 0  | 87.3 | 81 - 118                         |               |       |                |
| Surr: 4-Bromofluorobenzene  | 50.27  | 1.0                        | 50      | 0  | 101  | 85 - 114                         |               |       |                |
| Surr: Dibromofluoromethane  | 45.19  | 1.0                        | 50      | 0  | 90.4 | 80 - 119                         |               |       |                |

ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**QC BATCH REPORT**

|                           |        |                            |         |  |      |                                  |               |       |                |
|---------------------------|--------|----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| Batch ID: R338430 ( 0 )   |        | Instrument: VOA6           |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
| MS                        |        | Sample ID: HS19050304-05MS |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 14:26 |               |       |                |
| Client ID: 67WW09A-190502 |        | Run ID: VOA6_338430        |         | SeqNo: 5075202                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                   | Result | PQL                        | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Surr: Toluene-d8          | 52     | 1.0                        | 50      | 0  | 104  | 89 - 112                         |               |       |                |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )              |        | Instrument: VOA6            |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |         |                |
|--------------------------------------|--------|-----------------------------|---------|--|------|----------------------------------|---------------|---------|----------------|
| MSD                                  |        | Sample ID: HS19050304-05MSD |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 14:50 |               |         |                |
| Client ID: 67WW09A-190502            |        | Run ID: VOA6_338430         |         | SeqNo: 5075203                             |      | PrepDate:                        |               | DF: 1   |                |
| Analyte                              | Result | PQL                         | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD    | RPD Limit Qual |
| 1,1,1,2-Tetrachloroethane            | 18.05  | 1.0                         | 20      | 0  | 90.3 | 78 - 124                         | 17.96         | 0.499   | 20             |
| 1,1,1-Trichloroethane                | 16.75  | 1.0                         | 20      | 0  | 83.7 | 74 - 131                         | 17.27         | 3.11    | 20             |
| 1,1,2,2-Tetrachloroethane            | 20.62  | 1.0                         | 20      | 0  | 103  | 71 - 121                         | 19.07         | 7.82    | 20             |
| 1,1,2-Trichlor-1,2,2-trifluoroethane | 18.76  | 1.0                         | 20      | 0  | 93.8 | 70 - 136                         | 19.02         | 1.38    | 20             |
| 1,1,2-Trichloroethane                | 18.77  | 1.0                         | 20      | 0  | 93.9 | 80 - 119                         | 18.35         | 2.27    | 20             |
| 1,1-Dichloroethane                   | 15.96  | 1.0                         | 20      | 0  | 79.8 | 77 - 125                         | 16.46         | 3.1     | 20             |
| 1,1-Dichloroethene                   | 16.38  | 1.0                         | 20      | 0  | 81.9 | 71 - 131                         | 17.19         | 4.84    | 20             |
| 1,1-Dichloropropene                  | 17.86  | 1.0                         | 20      | 0  | 89.3 | 78 - 125                         | 18.19         | 1.86    | 20             |
| 1,2,3-Trichlorobenzene               | 24.61  | 1.0                         | 20      | 0  | 123  | 69 - 129                         | 21.91         | 11.6    | 20             |
| 1,2,3-Trichloropropane               | 20.12  | 1.0                         | 20      | 0  | 101  | 73 - 122                         | 18.51         | 8.29    | 20             |
| 1,2,4-Trichlorobenzene               | 21.58  | 1.0                         | 20      | 0  | 108  | 69 - 130                         | 20.05         | 7.37    | 20             |
| 1,2,4-Trimethylbenzene               | 19.04  | 1.0                         | 20      | 0  | 95.2 | 76 - 124                         | 17.85         | 6.43    | 20             |
| 1,2-Dibromo-3-chloropropane          | 23.37  | 1.0                         | 20      | 0  | 117  | 62 - 128                         | 20.62         | 12.5    | 20             |
| 1,2-Dibromoethane                    | 18.7   | 1.0                         | 20      | 0  | 93.5 | 77 - 121                         | 18.37         | 1.8     | 20             |
| 1,2-Dichlorobenzene                  | 20.02  | 1.0                         | 20      | 0  | 100  | 80 - 119                         | 18.43         | 8.27    | 20             |
| 1,2-Dichloroethane                   | 16.81  | 1.0                         | 20      | 0  | 84.1 | 73 - 128                         | 16.81         | 0.00614 | 20             |
| 1,2-Dichloropropane                  | 17.42  | 1.0                         | 20      | 0  | 87.1 | 78 - 122                         | 17.63         | 1.19    | 20             |
| 1,3,5-Trimethylbenzene               | 19.67  | 1.0                         | 20      | 0  | 98.3 | 75 - 124                         | 18.57         | 5.76    | 20             |
| 1,3-Dichlorobenzene                  | 19.64  | 1.0                         | 20      | 0  | 98.2 | 80 - 119                         | 18.44         | 6.33    | 20             |
| 1,3-Dichloropropane                  | 18.61  | 1.0                         | 20      | 0  | 93.0 | 80 - 119                         | 18.25         | 1.94    | 20             |
| 1,4-Dichlorobenzene                  | 19.37  | 1.0                         | 20      | 0  | 96.8 | 79 - 118                         | 18.41         | 5.05    | 20             |
| 2,2-Dichloropropane                  | 16.54  | 1.0                         | 20      | 0  | 82.7 | 60 - 139                         | 17.18         | 3.8     | 20             |
| 2-Butanone                           | 36.99  | 2.0                         | 40      | 0  | 92.5 | 56 - 143                         | 36.74         | 0.672   | 20             |
| 2-Chlorotoluene                      | 19.27  | 1.0                         | 20      | 0  | 96.3 | 79 - 122                         | 18.14         | 6       | 20             |
| 2-Hexanone                           | 38.67  | 2.0                         | 40      | 0  | 96.7 | 57 - 139                         | 36.41         | 6.02    | 20             |
| 4-Chlorotoluene                      | 19.19  | 1.0                         | 20      | 0  | 96.0 | 78 - 122                         | 18.02         | 6.3     | 20             |
| 4-Isopropyltoluene                   | 20.54  | 1.0                         | 20      | 0  | 103  | 77 - 127                         | 19.4          | 5.71    | 20             |
| 4-Methyl-2-pentanone                 | 38.72  | 2.0                         | 40      | 0  | 96.8 | 67 - 130                         | 37.53         | 3.12    | 20             |
| Acetone                              | 42.23  | 2.0                         | 40      | 5.033                                      | 93.0 | 39 - 160                         | 41.3          | 2.22    | 20             |
| Benzene                              | 17.15  | 1.0                         | 20      | 0  | 85.7 | 79 - 120                         | 17.22         | 0.446   | 20             |
| Bromobenzene                         | 18.86  | 1.0                         | 20      | 0  | 94.3 | 80 - 120                         | 17.54         | 7.22    | 20             |
| Bromochloromethane                   | 15.89  | 1.0                         | 20      | 0  | 79.5 | 78 - 123                         | 16.53         | 3.91    | 20             |
| Bromodichloromethane                 | 16.76  | 1.0                         | 20      | 0  | 83.8 | 79 - 125                         | 17.16         | 2.31    | 20             |
| Bromoform                            | 19.5   | 1.0                         | 20      | 0  | 97.5 | 66 - 130                         | 18.69         | 4.22    | 20             |

## ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

## QC BATCH REPORT

| Batch ID: R338430 ( 0 )     |        | Instrument: VOA6            |         | Method: VOLATILES ORGANICS BY METHOD 8260C |      |                                  |               |       |                |
|-----------------------------|--------|-----------------------------|---------|--|------|----------------------------------|---------------|-------|----------------|
| MSD                         |        | Sample ID: HS19050304-05MSD |         | Units: UG/L                                |      | Analysis Date: 14-May-2019 14:50 |               |       |                |
| Client ID: 67WW09A-190502   |        | Run ID: VOA6_338430         |         | SeqNo: 5075203                             |      | PrepDate:                        |               | DF: 1 |                |
| Analyte                     | Result | PQL                         | SPK Val | SPK Ref Value                              | %REC | Control Limit                    | RPD Ref Value | %RPD  | RPD Limit Qual |
| Bromomethane                | 14.44  | 1.0                         | 20      | 0  | 72.2 | 53 - 141                         | 14.83         | 2.67  | 20             |
| Carbon disulfide            | 33.71  | 2.0                         | 40      | 0  | 84.3 | 64 - 133                         | 34.64         | 2.72  | 20             |
| Carbon tetrachloride        | 17.32  | 1.0                         | 20      | 0  | 86.6 | 72 - 136                         | 17.45         | 0.729 | 20             |
| Chlorobenzene               | 18.86  | 1.0                         | 20      | 0  | 94.3 | 82 - 118                         | 18.68         | 0.95  | 20             |
| Chloroethane                | 15.18  | 1.0                         | 20      | 0  | 75.9 | 60 - 138                         | 16.04         | 5.54  | 20             |
| Chloroform                  | 15.86  | 1.0                         | 20      | 0  | 79.3 | 79 - 124                         | 16.36         | 3.15  | 20             |
| Chloromethane               | 13.31  | 1.0                         | 20      | 0  | 66.6 | 50 - 139                         | 14.06         | 5.44  | 20             |
| cis-1,2-Dichloroethene      | 15.91  | 1.0                         | 20      | 0  | 79.6 | 78 - 123                         | 16.27         | 2.26  | 20             |
| cis-1,3-Dichloropropene     | 18.59  | 1.0                         | 20      | 0  | 92.9 | 75 - 124                         | 18.73         | 0.759 | 20             |
| Dibromochloromethane        | 18.51  | 1.0                         | 20      | 0  | 92.5 | 74 - 126                         | 18.41         | 0.558 | 20             |
| Dibromomethane              | 17.47  | 1.0                         | 20      | 0  | 87.4 | 79 - 123                         | 17.7          | 1.28  | 20             |
| Dichlorodifluoromethane     | 15.52  | 1.0                         | 20      | 0  | 77.6 | 32 - 152                         | 15.98         | 2.93  | 20             |
| Ethylbenzene                | 18.16  | 1.0                         | 20      | 0  | 90.8 | 79 - 121                         | 18.41         | 1.34  | 20             |
| Hexachlorobutadiene         | 21.15  | 1.0                         | 20      | 0  | 106  | 66 - 134                         | 21.25         | 0.477 | 20             |
| Isopropylbenzene            | 19.08  | 1.0                         | 20      | 0  | 95.4 | 72 - 131                         | 18.73         | 1.81  | 20             |
| m,p-Xylene                  | 37.75  | 2.0                         | 40      | 0  | 94.4 | 80 - 121                         | 37.34         | 1.1   | 20             |
| Methylene chloride          | 16.03  | 2.0                         | 20      | 0  | 80.1 | 74 - 124                         | 16.74         | 4.31  | 20             |
| Naphthalene                 | 22.61  | 1.0                         | 20      | 0  | 113  | 61 - 128                         | 20.25         | 11    | 20             |
| n-Butylbenzene              | 20.47  | 1.0                         | 20      | 0  | 102  | 75 - 128                         | 19.47         | 5.02  | 20             |
| n-Propylbenzene             | 20.31  | 1.0                         | 20      | 0  | 102  | 76 - 126                         | 19.15         | 5.87  | 20             |
| o-Xylene                    | 19.03  | 1.0                         | 20      | 0  | 95.1 | 78 - 122                         | 19.15         | 0.637 | 20             |
| sec-Butylbenzene            | 20.71  | 1.0                         | 20      | 0  | 104  | 77 - 126                         | 19.76         | 4.7   | 20             |
| Styrene                     | 17.96  | 1.0                         | 20      | 0  | 89.8 | 78 - 123                         | 18.13         | 0.935 | 20             |
| tert-Butylbenzene           | 20.46  | 1.0                         | 20      | 0  | 102  | 78 - 124                         | 19.35         | 5.56  | 20             |
| Tetrachloroethene           | 19.07  | 1.0                         | 20      | 0  | 95.4 | 74 - 129                         | 18.9          | 0.914 | 20             |
| Toluene                     | 18.07  | 1.0                         | 20      | 0  | 90.4 | 80 - 121                         | 18.38         | 1.68  | 20             |
| trans-1,2-Dichloroethene    | 17.11  | 1.0                         | 20      | 0  | 85.5 | 75 - 124                         | 17.28         | 0.993 | 20             |
| trans-1,3-Dichloropropene   | 17.87  | 1.0                         | 20      | 0  | 89.3 | 73 - 127                         | 17.81         | 0.302 | 20             |
| Trichloroethene             | 17.81  | 1.0                         | 20      | 0  | 89.1 | 79 - 123                         | 18.37         | 3.1   | 20             |
| Trichlorofluoromethane      | 16.6   | 1.0                         | 20      | 0  | 83.0 | 65 - 141                         | 16.85         | 1.52  | 20             |
| Vinyl chloride              | 16.44  | 1.0                         | 20      | 0  | 82.2 | 58 - 137                         | 17.11         | 3.99  | 20             |
| Surr: 1,2-Dichloroethane-d4 | 43.69  | 1.0                         | 50      | 0  | 87.4 | 81 - 118                         | 43.63         | 0.13  | 20             |
| Surr: 4-Bromofluorobenzene  | 49.42  | 1.0                         | 50      | 0  | 98.8 | 85 - 114                         | 50.27         | 1.71  | 20             |
| Surr: Dibromofluoromethane  | 44.57  | 1.0                         | 50      | 0  | 89.1 | 80 - 119                         | 45.19         | 1.39  | 20             |

ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**QC BATCH REPORT**

| Batch ID: R338430 ( 0 )          |        | Instrument: VOA6                   |            | Method: VOLATILES ORGANICS BY METHOD 8260C |          |   |                 |              |                |
|----------------------------------|--------|------------------------------------|------------|--|----------|---|-----------------|--------------|----------------|
| <b>MSD</b>                       |        | Sample ID: <b>HS19050304-05MSD</b> |            | Units: <b>UG/L</b>                         |          | Analysis Date: <b>14-May-2019 14:50</b> |                 |              |                |
| Client ID: <b>67WW09A-190502</b> |        | Run ID: <b>VOA6_338430</b>         |            | SeqNo: <b>5075203</b>                      |          | PrepDate:                               |                 | DF: <b>1</b> |                |
| Analyte                          | Result | PQL                                | SPK Val    | SPK Ref Value                              | %REC     | Control Limit                           | RPD Ref Value   | RPD %RPD     | RPD Limit Qual |
| <i>Surr: Toluene-d8</i>          |        | <i>52.58</i>                       | <i>1.0</i> | <i>50</i>                                  | <i>0</i> | <i>105</i>                              | <i>89 - 112</i> | <i>52</i>    | <i>1.12 20</i> |

The following samples were analyzed in this batch:

|               |               |               |               |
|---------------|---------------|---------------|---------------|
| HS19050304-01 | HS19050304-02 | HS19050304-03 | HS19050304-04 |
| HS19050304-05 | HS19050304-06 | HS19050304-07 | HS19050304-08 |
| HS19050304-09 | HS19050304-10 |               |               |



**ALS Houston, US**

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**WorkOrder:** HS19050304

**QUALIFIERS,  
ACRONYMS, UNITS**

| <b>Qualifier</b> | <b>Description</b>  |
|------------------|---|
| *                | Value exceeds Regulatory Limit  |
| a                | Not accredited  |
| B                | Analyte detected in the associated Method Blank above the Reporting Limit |
| E                | Value above quantitation range  |
| H                | Analyzed outside of Holding Time  |
| J                | Analyte detected below quantitation limit                                 |
| M                | Manually integrated, see raw data for justification                       |
| n                | Not offered for accreditation   |
| ND               | Not Detected at the Reporting Limit                                       |
| O                | Sample amount is > 4 times amount spiked                                  |
| P                | Dual Column results percent difference > 40%                              |
| R                | RPD above laboratory control limit  |
| S                | Spike Recovery outside laboratory control limits                          |
| U                | Analyzed but not detected above the MDL/SDL                               |

| <b>Acronym</b> | <b>Description</b>                  |
|----------------|-------------------------------------|
| DCS            | Detectability Check Study           |
| DUP            | Method Duplicate                    |
| LCS            | Laboratory Control Sample           |
| LCSD           | Laboratory Control Sample Duplicate |
| MBLK           | Method Blank                        |
| MDL            | Method Detection Limit              |
| MQL            | Method Quantitation Limit           |
| MS             | Matrix Spike                        |
| MSD            | Matrix Spike Duplicate              |
| PDS            | Post Digestion Spike                |
| PQL            | Practical Quantitation Limit        |
| SD             | Serial Dilution                     |
| SDL            | Sample Detection Limit              |
| TRRP           | Texas Risk Reduction Program        |

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**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

---

| <b>Agency</b>   | <b>Number</b>     | <b>Expire Date</b> |
|-----------------|-------------------|--------------------|
| Illinois        | 004438            | 29-Jun-2019        |
| Louisiana       | 03087             | 30-Jun-2019        |
| Dept of Defense | ANAB L2231        | 20-Dec-2021        |
| Kansas          | E-10352 2018-2019 | 31-Jul-2019        |
| Oklahoma        | 2018-156          | 31-Aug-2019        |
| North Carolina  | 624-2019          | 31-Dec-2019        |
| Maryland        | 343, 2018-2019    | 30-Jun-2019        |
| Arkansas        | 19-028-0          | 27-Mar-2020        |
| Texas           | TX104704231-19-23 | 30-Apr-2020        |

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ALS Houston, US

Date: 15-May-19

**Client:** Aptim Environmental & Infrastructure, Inc.  
**Project:** Longhorn Army Ammunition Plant LHAAP-67  
**Work Order:** HS19050304

**SAMPLE TRACKING**

| Lab Samp ID   | Client Sample ID | Action | Date                | Person | New Location |
|---------------|------------------|--------|---------------------|--------|--------------|
| HS19050304-01 | 67WW14-190502    | Login  | 5/6/2019 6:04:22 PM | NDR    | WET357       |
| HS19050304-01 | 67WW14-190502    | Login  | 5/6/2019 6:04:22 PM | NDR    | VOA111       |
| HS19050304-01 | 67WW14-190502    | Login  | 5/6/2019 6:04:22 PM | NDR    | Sub          |
| HS19050304-01 | 67WW14-190502    | Login  | 5/6/2019 6:04:22 PM | NDR    | Sub          |
| HS19050304-01 | 67WW14-190502    | Login  | 5/6/2019 6:04:22 PM | NDR    | Sub          |

ALS Houston, US

Date: 15-May-19

## Sample Receipt Checklist

Client Name: CBI-Houston  
Work Order: HS19050304

Date/Time Received: **04-May-2019 08:55**  
Received by: **NDR**

Checklist completed by: Nilesh D. Ranchod 6-May-2019  
eSignature Date

Reviewed by: RJ Modashia 7-May-2019  
eSignature Date

Matrices: **water**Carrier name: **FedEx Priority Overnight**

|   |   |  |   |
|---|---|--|---|
| Shipping container/cooler in good condition?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on shipping container/cooler?      | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Not Present <input type="checkbox"/>            |
| Custody seals intact on sample bottles?                 | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | Not Present <input checked="" type="checkbox"/> |
| VOA/TX1005/TX1006 Solids in hermetically sealed vials?  | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | 1 Page(s)                                       |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Samplers name present on COC?                           | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |   |
| Chain of custody agrees with sample labels?             | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> |   |
| Samples in proper container/bottle?                     | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Sample containers intact?                               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Sufficient sample volume for indicated test?            | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| All samples received within holding time?               | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Container/Temp Blank temperature in compliance?         | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            |   |
| Temperature(s)/Thermometer(s):                          | 1.7c/ uc/c IR 25                        |  |   |
| Cooler(s)/Kit(s):                                       | 43361                                   |  |   |
| Date/Time sample(s) sent to storage:                    | 05/04/2019 13:00                        |  |   |
| Water - VOA vials have zero headspace?                  | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | No VOA vials submitted <input type="checkbox"/> |
| Water - pH acceptable upon receipt?                     | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | N/A <input type="checkbox"/>                    |
| pH adjusted?  | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | N/A <input type="checkbox"/>                    |
| pH adjusted by:   |   |  |   |

Login Notes: Sample Label time differ .  
67WW09A-190502  
COC = 12:35  
Label = 12:13

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:


Comments:

Corrective Action:

|  |          |                          |           |            |              |                  |             |                             |                                    |                                |                 |                         |                             |                                      |                          |
|--|----------|--------------------------|-----------|------------|--------------|------------------|-------------|-----------------------------|------------------------------------|--------------------------------|-----------------|-------------------------|-----------------------------|--------------------------------------|--------------------------|
| <b>APTIM</b>                             |          |                          |           |            |              |                  |             |                             |                                    |                                |                 | Page 1 of               |                             |                                      |                          |
| COC ID:                                  |          | LHAAP67-MAY2019-ALS      |           |            |              | TURNAROUND TIME: |             |                             |                                    | RUSH:                          |                 |                         |                             |                                      |                          |
| <b>PROJECT/CLIENT INFO</b>               |          |                          |           |            |              |                  |             | <b>LABORATORY</b>           |                                    |                                |                 | <b>OTHER INFO</b>       |                             |                                      |                          |
| Facility Name                            |          | Loughorn AAP             |           |            |              |                  |             | Lab Name                    |                                    | ALS Laboratories               |                 | Email Invoice To        |                             | FedInvoices@aptim.com                |                          |
| Project Number                           |          | 501032                   |           |            |              |                  |             | Lab Contact                 |                                    | RJ Modashia                    |                 |                         |                             |                                      |                          |
|  |          | LHAAP-67                 |           |            |              |                  |             | Email                       |                                    | RJ.Modashia@alsglobal.com      |                 | Email Report To         |                             | Susan.Huang@aptim.com                |                          |
| Address                                  |          | 1203-B East Grand Avenue |           |            |              |                  |             | Address                     |                                    | 10450 Stanchiff Rd., Suite 210 |                 | Mail Reports To         |                             | Susan Huang                          |                          |
| PMB 202                                  |          |                          |           |            |              |                  |             |                             |                                    |                                |                 | Address                 |                             | 4005 Port Chicago Highway, Suite 200 |                          |
| City                                     |          | Marshall                 |           | State      |              | TX               |             | City                        |                                    | Houston                        |                 | State                   |                             | TX                                   |                          |
| Postal Code                              |          | 75670                    |           | Country    |              | USA              |             | Postal Code                 |                                    | 77099                          |                 | Country                 |                             | USA                                  |                          |
| Phone Number                             |          | 713.243.7264             |           |            |              |                  |             | Phone Number                |                                    | 281.575.2279 or 281.530.5656   |                 |                         |                             |                                      |                          |
| Project Manager                          |          | Praveen Srivastav        |           |            |              |                  |             |                             |                                    |                                |                 | Shipping Company        |                             |                                      |                          |
| <b>SAMPLE DETAILS</b>                    |          |                          |           |            |              |                  |             | <b>ANALYSIS REQUESTED</b>   |                                    |                                |                 |                         |                             |                                      |                          |
| Sample ID                                | Location | Start Depth              | End Depth | Depth Unit | Field Matrix | Date             | Time (24hr) | # Of Cont.                  | Sample Container and Preservatives | ANALYSIS                       | 3-40 ml VOA/HCL | 3-40 ml VOA/HCL         | 3-40 ml VOA/Cool to 6 deg C | 2-40ml Amber/12504                   | 1-250ml /Cool to 6 deg C |
| 67WW14-190502                            | LHAAP 67 | 18.78                    | 19.02     |            | WG           | 5/2/19           | 0915        | 3                           |                                    | Vocs by 8360B                  |                 |                         |                             |                                      |                          |
| 67WW05-190502                            | LHAAP 67 | 24.46                    | 24.68     |            | WG           | 5/2/19           | 1005        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW12-190502                            | LHAAP 67 | 23.85                    | 24.05     |            | WG           | 5/2/19           | 1100        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW10-190502                            | LHAAP 67 | 22.31                    | 22.53     |            | WG           | 5/2/19           | 1145        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW09A-190502                           | LHAAP 67 | 24.35                    | 24.58     |            | WG           | 5/2/19           | 1235        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW09A-190502-NB                        | LHAAP 67 | 24.35                    | 24.58     |            | WG           | 5/2/19           | 1235        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW09A-190502-NB-D                      | LHAAP 67 | 24.35                    | 24.58     |            | WG           | 5/2/19           | 1235        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW01-190503                            | LHAAP 67 | 22.47                    | 23.23     |            | WG           | 5/3/19           | 0810        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW15-190503                            | LHAAP 67 | 22.04                    | 23.23     |            | WG           | 5/3/19           | 0905        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW09-190503                            | LHAAP 67 | 19.83                    | 20.06     |            | WG           | 5/3/19           | 0950        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| 67WW07-190503                            | LHAAP 67 | 21.72                    | 21.95     |            | WG           | 5/3/19           | 1035        | 3                           |                                    |                                |                 |                         |                             |                                      |                          |
| Trip BLANK                               | LHAAP 67 |                          |           |            | W            | 5/3/19           |             | 2                           |                                    |                                |                 |                         |                             |                                      |                          |
| ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS |          |                          |           |            |              |                  |             | RELINQUISHED BY/AFFILIATION |                                    | DATE/TIME                      |                 | ACCEPTED BY/AFFILIATION |                             | DATE/TIME                            |                          |
|  |          |                          |           |            |              |                  |             | Sunita Desai / SHATE        |                                    | 5/3/19 1200                    |                 | R. Chapp / SHATE        |                             | 5/3/19 1235                          |                          |
|  |          |                          |           |            |              |                  |             |                             |                                    |                                |                 | order # 43361           |                             | 1235                                 |                          |
|  |          |                          |           |            |              |                  |             |                             |                                    |                                |                 | TEMP 1-7C               |                             |                                      |                          |

HS19050304

Aptim Environmental & Infrastructure, Inc.  
 Loughorn Army Ammunition Plant LHAAP-67

|  |                              |                    |                           |
|--|------------------------------|--------------------|---------------------------|
|  <b>ALS</b><br>10450 Stancliff Rd., Suite 210<br>Houston, Texas 77099<br>Tel. 281.530.5656<br>Fax. +1 281 530 5887 | <b>CUSTODY SEAL</b>          |                    | Seal Broken By: <i>KA</i> |
|  | Date: <i>5/3/19</i>          | Time: <i>12:00</i> | Date: <i>5/3/19</i>       |
|  | Name: <i>Scott Biesinger</i> |                    |                           |
|  | Company: <i>BH&amp;T</i>     |                    |                           |

*43361* MAY 04 2019  
MAY 04 2019



Must Deliver Next Business Day  
Time and Temperature Sensitive!

*43361*

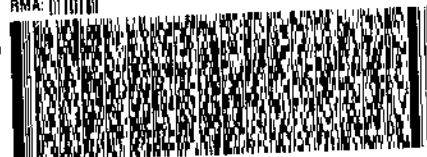
ORIGIN ID: SGRA (903) 930-6183  
SCOTT BIESINGER  
APTIM ENVIRONMENTAL & INFRASTRUCTURE  
1203-B EAST BRAND AVE  
PMB 202  
MARSHALL, TX 75670  
UNITED STATES US

SHIP DATE: 23APR19  
ACTWT: 1.00 LB MAX  
CAD: 300130/CAPE3211  
DIMS: 18x16x13 IN

TO **CLIENT SERVICES**  
**ALS LABORATORY GROUP**  
**10450 STANCLIFF ROAD**  
**SUITE 210**  
**HOUSTON TX 77099**

(231) 530-5656  
REF: LHAAP 67 - RJ

RMA: 01101101



**FedEx**  
Express



**FedEx**

TRK#  
0221 4809 7833 1019

**SATURDAY 12:00P**  
**PRIORITY OVERNIGHT**

**X0 SGRA**

**77099**  
TX-US  
IAH



CTD 5121968 83MAY19 66GA 559C1266C/0CBA

# Appendix E

## Mann-Kendall Trend Test Results



## GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

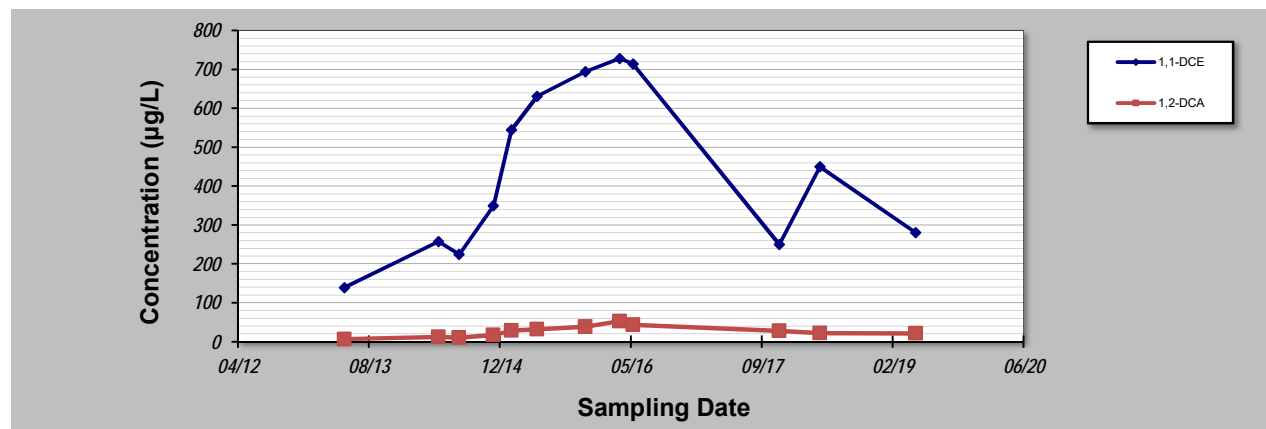
Evaluation Date: **16-Aug-19**  
 Facility Name: **LHAAP-67**  
 Conducted By: **Robert Mayer**

Job ID: **501032**  
 Constituent: **67WW01**  
 Concentration Units: **µg/L**

Sampling Point ID: **1,1-DCE** **1,2-DCA**

| Sampling Event | Sampling Date | 67WW01 CONCENTRATION (µg/L) |    |  |  |  |  |
|----------------|---------------|-----------------------------|----|--|--|--|--|
| 1              | 13-May-13     | 139                         | 7  |  |  |  |  |
| 2              | 7-May-14      | 257                         | 12 |  |  |  |  |
| 3              | 25-Jul-14     | 224                         | 11 |  |  |  |  |
| 4              | 3-Dec-14      | 349                         | 17 |  |  |  |  |
| 5              | 10-Feb-15     | 544                         | 29 |  |  |  |  |
| 6              | 19-May-15     | 631                         | 31 |  |  |  |  |
| 7              | 19-Nov-15     | 694                         | 39 |  |  |  |  |
| 8              | 29-Mar-16     | 728                         | 53 |  |  |  |  |
| 9              | 19-May-16     | 714                         | 43 |  |  |  |  |
| 10             | 28-Nov-17     | 250                         | 28 |  |  |  |  |
| 11             | 3-May-18      | 450                         | 22 |  |  |  |  |
| 12             | 3-May-19      | 280                         | 21 |  |  |  |  |
| 13             |               |                             |    |  |  |  |  |
| 14             |               |                             |    |  |  |  |  |
| 15             |               |                             |    |  |  |  |  |
| 16             |               |                             |    |  |  |  |  |
| 17             |               |                             |    |  |  |  |  |
| 18             |               |                             |    |  |  |  |  |
| 19             |               |                             |    |  |  |  |  |
| 20             |               |                             |    |  |  |  |  |

|                             |                  |            |  |  |  |  |  |
|-----------------------------|------------------|------------|--|--|--|--|--|
| Coefficient of Variation:   | 0.49             | 0.54       |  |  |  |  |  |
| Mann-Kendall Statistic (S): | 24               | 26         |  |  |  |  |  |
| Confidence Factor:          | 94.2%            | 95.7%      |  |  |  |  |  |
| Concentration Trend:        | Prob. Increasing | Increasing |  |  |  |  |  |



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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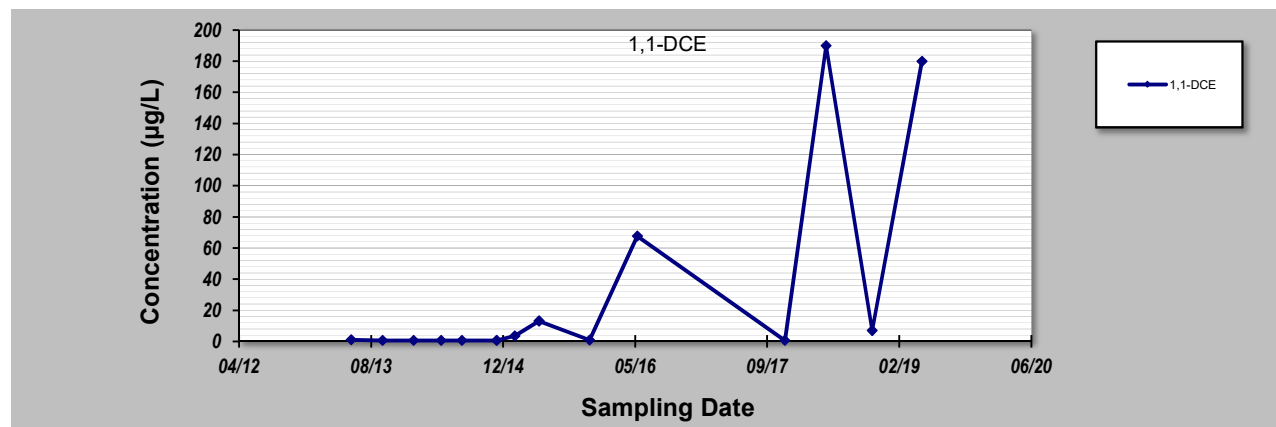
## GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **25-Aug-19**  
 Facility Name: **LHAAP-67**  
 Conducted By: **Robert Mayer**

Job ID: **501032**  
 Constituent: **67WW02**  
 Concentration Units: **µg/L**

Sampling Point ID: **1,1-DCE**

| Sampling Event              | Sampling Date | 67WW02 CONCENTRATION (µg/L) |  |  |  |  |  |
|-----------------------------|---------------|-----------------------------|--|--|--|--|--|
| 1                           | 31-May-13     | 1                           |  |  |  |  |  |
| 2                           | 27-Sep-13     | 0.5                         |  |  |  |  |  |
| 3                           | 23-Jan-14     | 0.5                         |  |  |  |  |  |
| 4                           | 6-May-14      | 0.5                         |  |  |  |  |  |
| 5                           | 24-Jul-14     | 0.5                         |  |  |  |  |  |
| 6                           | 3-Dec-14      | 0.5                         |  |  |  |  |  |
| 7                           | 10-Feb-15     | 3.59                        |  |  |  |  |  |
| 8                           | 12-May-15     | 13.2                        |  |  |  |  |  |
| 9                           | 12-May-15     | 13                          |  |  |  |  |  |
| 10                          | 19-Nov-15     | 0.857                       |  |  |  |  |  |
| 11                          | 19-May-16     | 67.6                        |  |  |  |  |  |
| 12                          | 28-Nov-17     | 0.5                         |  |  |  |  |  |
| 13                          | 3-May-18      | 190                         |  |  |  |  |  |
| 14                          | 25-Oct-18     | 6.9                         |  |  |  |  |  |
| 15                          | 1-May-19      | 180                         |  |  |  |  |  |
| 16                          |               |                             |  |  |  |  |  |
| 17                          |               |                             |  |  |  |  |  |
| 18                          |               |                             |  |  |  |  |  |
| 19                          |               |                             |  |  |  |  |  |
| 20                          |               |                             |  |  |  |  |  |
| Coefficient of Variation:   |               | 2.02                        |  |  |  |  |  |
| Mann-Kendall Statistic (S): |               | 48                          |  |  |  |  |  |
| Confidence Factor:          |               | 99.1%                       |  |  |  |  |  |
| Concentration Trend:        |               | Increasing                  |  |  |  |  |  |



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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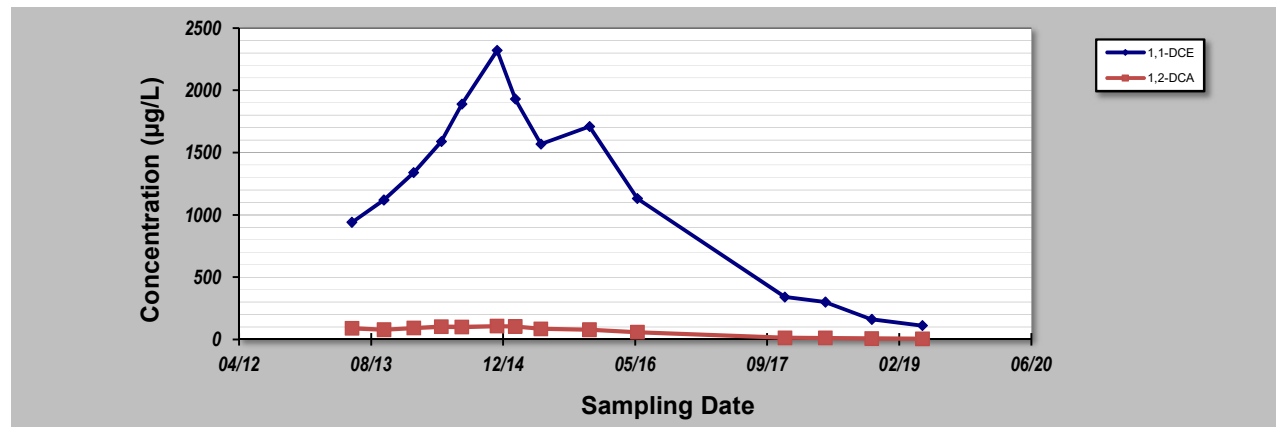
## GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **16-Aug-19**  
 Facility Name: **LHAAP-67**  
 Conducted By: **Robert Mayer**

Job ID: **501032**  
 Constituent: **67WW08**  
 Concentration Units: **µg/L**

Sampling Point ID: **1,1-DCE** **1,2-DCA**

| Sampling Event              | Sampling Date | 67WW08 CONCENTRATION (µg/L) |            |  |  |  |  |
|-----------------------------|---------------|-----------------------------|------------|--|--|--|--|
| 1                           | 3-Jun-13      | 940                         | 89.2       |  |  |  |  |
| 2                           | 2-Oct-13      | 1,120                       | 76.5       |  |  |  |  |
| 3                           | 23-Jan-14     | 1,340                       | 89.9       |  |  |  |  |
| 4                           | 7-May-14      | 1,590                       | 101        |  |  |  |  |
| 5                           | 24-Jul-14     | 1,890                       | 98.9       |  |  |  |  |
| 6                           | 4-Dec-14      | 2,320                       | 106        |  |  |  |  |
| 7                           | 11-Feb-15     | 1,930                       | 104        |  |  |  |  |
| 8                           | 19-May-15     | 1,570                       | 85.6       |  |  |  |  |
| 9                           | 19-Nov-15     | 1,710                       | 77.6       |  |  |  |  |
| 10                          | 19-May-16     | 1,130                       | 56.1       |  |  |  |  |
| 11                          | 28-Nov-17     | 340                         | 13         |  |  |  |  |
| 12                          | 1-May-18      | 300                         | 11         |  |  |  |  |
| 13                          | 23-Oct-18     | 160                         | 6.5        |  |  |  |  |
| 14                          | 3-May-19      | 110                         | 5.1        |  |  |  |  |
| 15                          |               |                             |            |  |  |  |  |
| 16                          |               |                             |            |  |  |  |  |
| 17                          |               |                             |            |  |  |  |  |
| 18                          |               |                             |            |  |  |  |  |
| 19                          |               |                             |            |  |  |  |  |
| 20                          |               |                             |            |  |  |  |  |
| Coefficient of Variation:   |               | 0.61                        | 0.60       |  |  |  |  |
| Mann-Kendall Statistic (S): |               | -31                         | -51        |  |  |  |  |
| Confidence Factor:          |               | 95.0%                       | 99.8%      |  |  |  |  |
| Concentration Trend:        |               | Prob. Decreasing            | Decreasing |  |  |  |  |



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

**DISCLAIMER:** The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.

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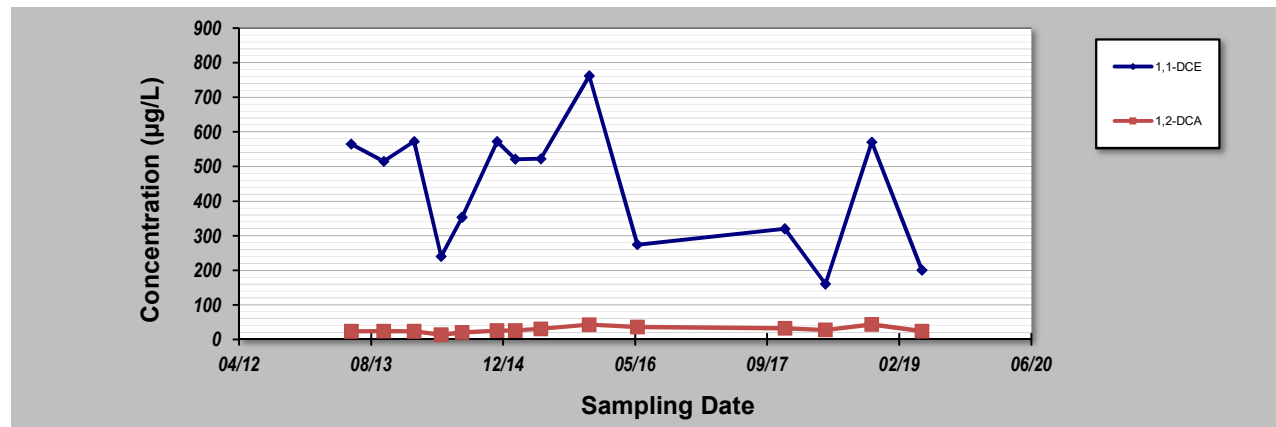
## GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **16-Aug-19**  
 Facility Name: **LHAAP-67**  
 Conducted By: **Robert Mayer**

Job ID: **501032**  
 Constituent: **67WW13**  
 Concentration Units: **µg/L**

Sampling Point ID: **1,1-DCE** **1,2-DCA**

| Sampling Event              | Sampling Date | 67WW13 CONCENTRATION (µg/L) |            |  |  |  |  |  |  |
|-----------------------------|---------------|-----------------------------|------------|--|--|--|--|--|--|
| 1                           | 31-May-13     | 565                         | 23.1       |  |  |  |  |  |  |
| 2                           | 1-Oct-13      | 515                         | 23.8       |  |  |  |  |  |  |
| 3                           | 24-Jan-14     | 572                         | 22.9       |  |  |  |  |  |  |
| 4                           | 6-May-14      | 240                         | 13.7       |  |  |  |  |  |  |
| 5                           | 25-Jul-14     | 353                         | 19.8       |  |  |  |  |  |  |
| 6                           | 4-Dec-14      | 572                         | 24.9       |  |  |  |  |  |  |
| 7                           | 11-Feb-15     | 521                         | 26         |  |  |  |  |  |  |
| 8                           | 19-May-15     | 522                         | 30.6       |  |  |  |  |  |  |
| 9                           | 18-Nov-15     | 762                         | 42.6       |  |  |  |  |  |  |
| 10                          | 19-May-16     | 274                         | 35.7       |  |  |  |  |  |  |
| 11                          | 28-Nov-17     | 320                         | 32         |  |  |  |  |  |  |
| 12                          | 1-May-18      | 160                         | 27         |  |  |  |  |  |  |
| 13                          | 23-Oct-18     | 570                         | 43         |  |  |  |  |  |  |
| 14                          | 1-May-19      | 200                         | 24         |  |  |  |  |  |  |
| 15                          |               |                             |            |  |  |  |  |  |  |
| 16                          |               |                             |            |  |  |  |  |  |  |
| 17                          |               |                             |            |  |  |  |  |  |  |
| 18                          |               |                             |            |  |  |  |  |  |  |
| 19                          |               |                             |            |  |  |  |  |  |  |
| 20                          |               |                             |            |  |  |  |  |  |  |
| Coefficient of Variation:   |               | 0.41                        | 0.30       |  |  |  |  |  |  |
| Mann-Kendall Statistic (S): |               | -20                         | 45         |  |  |  |  |  |  |
| Confidence Factor:          |               | 84.8%                       | 99.3%      |  |  |  |  |  |  |
| Concentration Trend:        |               | Stable                      | Increasing |  |  |  |  |  |  |



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
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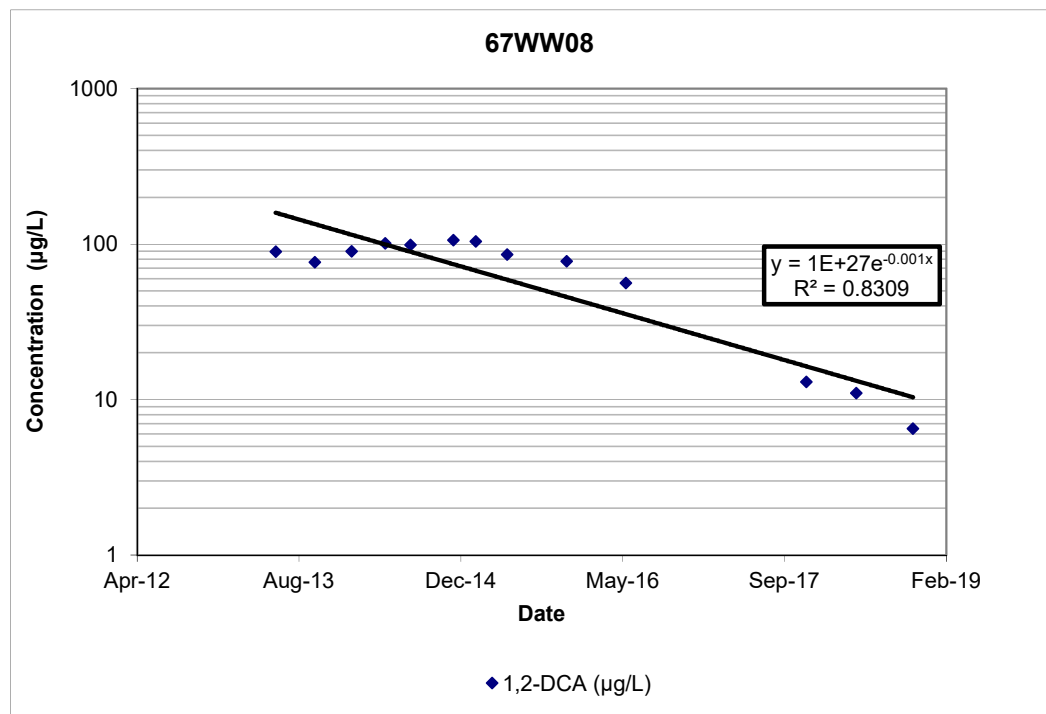


# Appendix F

## Regression Analysis

### Time-Dependent Attenuation Rate Constant and Estimated Cleanup Time 67WW08

| Date      | 1,2-DCA<br>(µg/L) |
|-----------|-------------------|
| 3-Jun-13  | 89.2              |
| 2-Oct-13  | 76.5              |
| 23-Jan-14 | 89.9              |
| 7-May-14  | 101               |
| 24-Jul-14 | 98.9              |
| 4-Dec-14  | 106               |
| 11-Feb-15 | 104               |
| 19-May-15 | 85.6              |
| 19-Nov-15 | 77.6              |
| 19-May-16 | 56.1              |
| 28-Nov-17 | 13                |
| 1-May-18  | 11                |
| 23-Oct-18 | 6.5               |
| 1-May-19  | 5.1               |



| Chemical: TCE<br>Well ID | Attenuation<br>Rate Constant<br>(day <sup>-1</sup> ) | Attenuation<br>Half-life<br>(days) | Attenuation<br>Half-life<br>(years) | Current<br>Conc.<br>(µg/L) | Target<br>Concentration for<br>TCE<br>(µg/L) | Estimated<br>Cleanup<br>Time<br>(years) |
|--------------------------|--|------------------------------------|-------------------------------------|----------------------------|--|---|
| 1,2-DCA                  | 0.0010   | 693.1                              | 1.9                                 | 5.1                        | 5  | 0.1                                     |

#### Notes:

The estimated cleanup time was calculated as the time it would take the most recent detected TCE concentration to reach the MCL using the site-specific attenuation rate, and assuming first order degradation kinetics.

µg/L - micrograms per liter

MCL - maximum contaminant level

DCE - dichloroethene

DCA - dichloroethane





**DEPARTMENT OF THE ARMY**  
**LONGHORN ARMY AMMUNITION PLANT**  
**POST OFFICE BOX 220**  
**RATCLIFF, AR 72951**

March 17, 2020

DAIN-ODB-LO

Mr. William Rhotenberry  
 U.S. Environmental Protection Agency  
 1201 Elm Street, Suite 500  
 Dallas, TX 75270-2002

**Re: Draft Second Annual Remedial Action Operation Report, LHAAP-35B (37),  
 Chemical Laboratory, Longhorn Army Ammunition Plant, Karnack, Texas, March  
 2020**

Dear Mr. Rhotenberry,

One hard copy and one compact disc (CD) of the above-referenced document are being transmitted to you for your review. Review comments are requested by April 16, 2020.

The document was prepared by Bhate Environmental Associates, Inc., (Bhate) team, on behalf of the Army as part of Bhate's Performance Based Remediation contract for the facility. I ask that Kim Nemmers, Bhate's Project Manager, be copied on any communications related to the project.

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

Rose M. Zeiler, Ph.D.  
 Longhorn AAP Site Manager

Copies furnished:

A. Palmie, TCEQ, Austin, TX (letter)  
 P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)  
 R. Smith USACE, Tulsa District, OK (1 hard copy and 1 CD)  
 A. Williams, USACE, Tulsa District, OK (1 CD)  
 A. Maly USAEC, San Antonio, TX (1 CD)  
 K. Nemmers, Bhate, Lakewood, CO (1 hard copy and 1 CD)  
 P. Srivastav, APTIM, Houston, TX (letter)



DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
POST OFFICE BOX 220  
RATCLIFF, AR 72951

March 17, 2020

DAIN-ODB-LO

Ms. April Palmie  
Texas Commission on Environmental Quality,  
Superfund Section, MC-136  
12100 Park 35 Circle, Bldg D  
Austin, TX 78753

**Re: Draft Second Annual Remedial Action Operation Report, LHAAP-35B (37),  
Chemical Laboratory, Longhorn Army Ammunition Plant, Karnack, Texas, March  
2020**

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The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

A handwritten signature in cursive script, reading "Rose M. Zeiler", is positioned above the typed name.

Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

Copies furnished:

W. Rhotenberry, USEPA Region 6, Dallas, TX (letter)  
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy and 1 CD)  
R. Smith, USACE, Tulsa District, OK (1 hard copy and 1 CD)  
A. Williams, USACE, Tulsa District, OK (1 CD)  
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DEPARTMENT OF THE ARMY  
LONGHORN ARMY AMMUNITION PLANT  
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RATCLIFF, AR 72951

March 25, 2020

DAIN-ODB-LO

Mr. William Rhotenberry  
US Environmental Protection Agency  
Region 6  
201 Elm Street, Suite 500  
Dallas, TX 75270

Re: Request for Schedule Extension for LHAAP-47

Dear Mr. Rhotenberry,

An extension of the LHAAP-47 schedule is respectfully requested based on the results of the Preliminary Site Investigation (PSI) Addendum 2 results, reported to you in December 2019 as a draft interim report. The December report revealed that the zone of TCE impact near Building 46-A in soil and groundwater, including residual DNAPL, was greater than anticipated. Additional fieldwork is required to adequately characterize extent and to support the identification of additional remedial alternatives.

This additional information comprises significant new site conditions that constitute good cause in accordance with Federal Facility Agreement (FFA) Sections XVI.D and XVII.A and will result in an additional delay to the completion of the RI/FS phase (Reference Army correspondence dated August 5, 2019).

The proposed schedule to collect and report additional information as well as a revision of the Feasibility Study, Proposed Plan and ROD is as follows:

Draft PSI Addendum 2 Work Plan Addendum: May 1, 2020

Draft PSI Addendum 2 Report: October 26, 2020

Draft FS Addendum change from March 31, 2020 to December 8, 2020

Draft Revised PP change from July 1, 2020 to March 31, 2021

Revised Draft Final ROD change from September 30, 2020 to September 15, 2021

The point of contact for this action is the undersigned. I may be contacted at 479-635-0110, or by email at [rose.m.zeiler.civ@mail.mil](mailto:rose.m.zeiler.civ@mail.mil).

Sincerely,

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Rose M. Zeiler, Ph.D.  
Longhorn AAP Site Manager

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A. Maly, USAEC, San Antonio, TX  
K. Nemmers – (for project files)



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March 25, 2020

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