LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

ADMINISTRATIVE RECORD

Volume 12

2021

Bate Stamp Numbers
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Longhorn Army Ammunition Plant

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

VOLUME 12

2021

A. Title: (Cont'd) Report – Final Remedial Action Completion Report, LHAAP-04 Former Pilot Wastewater Treatment Plant, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021
Author(s): Department of the Army
Recipient: U.S. Environmental Protection Agency and Texas Commission on Environmental Quality
Date: April 15, 2021
Bate Stamp: 01028266 – 01028523

B. Title: Report – Final Remedial Action Completion Report, LHAAP-16 Landfill 16, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021
Author(s): Department of the Army
Recipient: U.S. Environmental Protection Agency and Texas Commission on Environmental Quality
Date: April 15, 2021
Bate Stamp: 01028524 – 01029095

C. Title: (Cont'd) Report – Appendix D to Final Remedial Action Completion Report, LHAAP-16 Landfill 16, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021
Author(s): Department of the Army
Recipient: U.S. Environmental Protection Agency and Texas Commission on Environmental Quality
Date: April 15, 2021
Bate Stamp: 01029096 – 01030113

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	65	TOC	K1910254-006.04	28.1311 ppm	0.0561 ppm	0.2000%	2019/11/16 22:08

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.0914	280.9138	199.67	203.23	3.56	50.25	10:25
2	TOC	28.1708	281.7079	200.20	204.08	3.88	50.24	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	66	TOC	K1910254-007.04	1.9818 ppm	0.2031 ppm	10.2500%	2019/11/16 22:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.1255	21.2548	23.41	27.00	3.59	50.28	10:27
2	TOC	1.8382	18.3820	21.46	24.95	3.49	50.25	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 15

	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)	23.8729 ppm (PASS)	0.0000 ppm	0%	2019/11/16 23:04

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	23.8729	238.7285	171.51	175.00	3.49	50.24	10:33

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 15

	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%	2019/11/16 23:18

Pos	Base Analysis	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

	Type									
D	TOC	0 ppm	1	0.0000	0.0000	6.38	9.91	3.53	50.26	10:30

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 15

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	67	TOC	K1910254-008.04	1.4375 ppm	0.0190 ppm	1.3200%	2019/11/16 23:33

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4509	14.5090	18.83	22.51	3.68	50.25	10:28
2	TOC	1.4241	14.2409	18.65	22.21	3.56	50.31	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	68	TOC	K1910299-001.03	7.1545 ppm	0.2045 ppm	2.8600%	2019/11/17 00:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.2991	72.9907	58.53	62.07	3.54	50.24	10:30
2	TOC	7.0099	70.0988	56.57	60.19	3.63	50.26	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	69	TOC	K1910765-001.01	8.9810 ppm	0.1088 ppm	1.2100%	2019/11/17 00:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.0579	90.5792	70.47	73.94	3.47	50.27	10:31
2	TOC	8.9041	89.0412	69.42	73.00	3.58	50.23	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	70	TOC	K1910765-002.01	13.5412 ppm	0.1337 ppm	0.9900%	2019/11/17 00:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	13.6357	136.3574	101.54	105.14	3.60	50.23	10:28
2	TOC	13.4467	134.4673	100.26	104.04	3.78	50.25	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	71	TOC	K1910765-003.01	22.6620 ppm	0.0885 ppm	0.3900%	2019/11/17 01:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	22.5994	225.9944	162.39	166.08	3.69	50.23	10:26
2	TOC	22.7247	227.2466	163.24	166.80	3.56	50.12	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	72	TOC	K1910765-004.01	10.0901 ppm	0.3055 ppm	3.0300%	2019/11/17 01:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	10.3062	103.0616	78.94	82.74	3.80	50.11	10:30
2	TOC	9.8741	98.7407	76.01	79.77	3.76	50.16	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	73	TOC	K1910760-001.01	1.1733 ppm	0.0796 ppm	6.7800%	2019/11/17 02:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2296	12.2963	17.33	20.90	3.57	50.08	10:28
2	TOC	1.1171	11.1707	16.57	20.17	3.61	50.20	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	74	TOC	K1910760-001.01 ms	25.8462 ppm	0.0000 ppm	0.0000%	2019/11/17 02:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.8462	258.4622	184.42	187.91	3.49	50.11	10:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	75	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/17 03:05

Rep	Base			Adjusted		Baseline	Pressure	Run

#	Analysis Type	ppm	µg	(Abs)	NDIR (Abs)	(Abs)	(psig)	Time
1	TOC	0.0000	0.0000	6.30	9.69	3.39	50.09	10:28
2	TOC	0.0000	0.0000	5.64	9.26	3.62	50.11	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.9824 (IC) (v1320)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 15

	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)	23.6725 ppm (PASS)	0.0000 ppm	0%	2019/11/17 03:33

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	23.6725	236.7250	170.15	173.77	3.62	50.15	10:35

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 15

	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%	2019/11/17 03:48

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.73	9.31	3.58	50.18	10:30

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

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1319	0.9217	1.0210	0.0000	0.0000	0.0000	2019/11/13 13:58	Fusion1 (Fusion1)
v1320	2.3307	1.7570	0.0000	0.0000	0.0000	2019/11/15 13:57	Fusion1 (Fusion1)

Calibrations

Name: CAS_salt_010711 (TOC)

Version: v30

Ver Creation: 2019/03/05 17:42

Comment:

Operator: Fusion1 (Fusion1)

Basic Analysis Type TOC

Calibration curve formula: TOC: y = 6.788x + 9.463

r^2 value: TOC: r^2 = 0.99963

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

Ver Creation: 2019/02/21 17:57

Comment:

Operator: Fusion1 (Fusion1)

Parameter	Value
SampleVolume	10.0 mL
Dilution	1:10
AcidVolume	0.5 ml
ReagentVolume	2.0 ml
UVReactorPrerinse	Off
UVReactorPrerinseVolume	5.0
NumberOfUVReactorPrerinses	1
ICSpargeTime	1.00 mins
DetectorSweepFlow	500 ml/min
PreSpargeTime	2.00 mins
SystemFlow	500 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
ICSpargeRinseVolume	12.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	150 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
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

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	2019/11/17 04:03

ALS Environmental

StarLIMS Run: 660112, 660113, 660114, 660115

Analysis: DOC/TOC

Method: SM 5310 C, 9060A, 415.1, 9060

CCV: 11-GEN-05-82C 50 ppm LCS: 11-GEN-05-79J 25.0 ppm

ICAL Date: 3/6/19

ICAL ID: 11-GEN-05-76H

ICS ID: 11-GEN-05-78M

ICS TV: 25.0 ppm ICS % R < 1

Spike ID: 11-GEN-05-82C 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-83A

21 % H3PO4: 11-GEN-05-82G

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, N11314F, Marge

FILTER ID: 16967789

Analyzed By: BUP	Date Analyzed: 11/15/19
Reviewed By: [illegible]	Date Reviewed: 11/19/19

Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1931753; 1932010

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2319 (252142)

General Set Information: There were twenty field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: NA

Method QC data: The method blank (LMB 684808) was less than 1/2 the CRDL. The recovery for the LCS (684805) was within acceptable parameters.

MS/MSD Analysis: MS/MSD was performed on samples 1931753007/08 (Client ID: 04WW11-191106). 3.0µL of Working Standard Solution Horizon ID 49947 was added to 10.0mL of sample preparation. The spike target was 3.µg/L. The MS/MSD (684133/34) percent recoveries and relative percent difference (RPD) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1. The Reporting Limit Verification Standard (RLVS – 684806) is reported from the analysis of the Laboratory Control Sample (LCS – 684805) at a level of 3.0µg/L. Due to limitations of the Chemstation Software, some of the chromatographic peaks may require manual integrations. A manual integration was performed for one of the Initial Calibration analyses (datafile: 20SEPI03) along with datafile 19OCT19D02.

Thomas Bosch	November 20, 2019
Analyst	Date

ANALYTICAL REPORT

Report Date: November 21, 2019

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1931753**
Project ID: HS19110320
Purchase Order: HS19110320
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
04WW02-191105	1931753001	11/05/19	11/08/19	
04WW02-191105-FD	1931753002	11/05/19	11/08/19	
LHSMW02-191105	1931753003	11/05/19	11/08/19	
04WW03-191106	1931753004	11/06/19	11/08/19	
04WW06-191106	1931753005	11/06/19	11/08/19	
04WW11-191106	1931753006	11/06/19	11/08/19	
04WW05-191106	1931753009	11/06/19	11/08/19	
04WW08-191106	1931753010	11/06/19	11/08/19	
04WW04-191106	1931753011	11/06/19	11/08/19	
LHSMW01-191106	1931753012	11/06/19	11/08/19	
Fire Station Well-191106	1931753013	11/06/19	11/08/19	

Client QC ID *	Lab ID	Collect Date	Receive Date	Sampling Site
04WW11-191106MS	1931753007	11/06/19	11/08/19	
04WW11-191106MSD	1931753008	11/06/19	11/08/19	

***Client QC is reported as part of the Quality Control results report, if requested.**

ANALYTICAL REPORT

Workorder: 34-1931753
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **04WW02-191105** | Sampling Site: NA | Collected: 11/05/2019
Lab ID: 1931753001 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 09:45 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **04WW02-191105-FD** | Sampling Site: NA | Collected: 11/05/2019
Lab ID: 1931753002 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 09:59 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **LHSMW02-191105** | Sampling Site: NA | Collected: 11/05/2019
Lab ID: 1931753003 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 10:13 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **04WW03-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753004 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 10:27 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

ANALYTICAL REPORT

Workorder: 34-1931753
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **04WW06-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753005 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 10:41 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **04WW11-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753006 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 10:55 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **04WW05-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753009 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 11:36 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **04WW08-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753010 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 11:50 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**13**	1.0	2.0	4.0	1	

ANALYTICAL REPORT

Workorder: 34-1931753
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **04WW04-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753011 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 12:17 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **LHSMW01-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753012 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 12:31 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **Fire Station Well-191106** | Sampling Site: NA | Collected: 11/06/2019
Lab ID: 1931753013 | Media: 125 mL Nalgene | Received: 11/08/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2319 (HBN: 252142) | **%Solids:** NA
Analyzed: 11/19/2019 12:45 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 11/19/2019 17:26	/S/ Stephen Brose 11/21/2019 07:07

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1931753
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	PJLA (DoD ELAP)	L17-506	http://www.pjlabs.com
	PJLA (ISO 17025)	L17-507-R1	http://www.pjlabs.com
	Utah (TNI)	UT00953	http://lams.nelac-institute.org/search
	Iowa (TNI)	IA# 376	http://www.shl.uiowa.edu/labcert/idnr/
	Kansas	E-10416	http://www.kdheks.gov/envlab/disclaimer.html
Industrial Hygiene	AIHA (ISO 17025 & AIHA IHLAP)	101574	http://www.aihaaccreditedlabs.org
	DOECAP-AP	L18-606	http://www.pjlabs.com
	Washington	C596	https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Laboratory-Accreditation
Dietary Supplements	PJLA (ISO 17025)	L17-507-R1	http://www.pjlabs.com

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< Means this testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1931753

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2319 (HBN: 252142)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Blank

LMB: 684808
Analyzed: 11/19/2019 09:32
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 684805
Analyzed: 11/19/2019 09:04
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	2.81	3.00	93.7	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample:	1931753006	**MS:**	1931753007				**MSD:**	1931753008			
Analyzed:	11/19/2019 10:55	**Analyzed:**	11/19/2019 11:08				**Analyzed:**	11/19/2019 11:22			
Dilution:	1	**Dilution:**	1				**Dilution:**	1			
Units:	ug/L	**Units:**	ug/L				**Units:**	ug/L			
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	2.72	3	90.7	78.8	123.8	2.94	98.1	7.82	0.0	20.0

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
11/20/2019 12:46	11/21/2019 07:07

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

1931753

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

18698/#2

SAMPLING STATE: **Texas**

COC ID: **12582**

1931753

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	HS19110320
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS19110320-01**	**04WW02-191105**	**Water**	**05 Nov 2019 08:30**
	SUB_Perch-6850			21 Nov 2019
2.	**HS19110320-02**	**04WW02-191105-FD**	**Water**	**05 Nov 2019 08:30**
	SUB_Perch-6850			21 Nov 2019
3.	**HS19110320-03**	**LHSMW02-191105**	**Water**	**05 Nov 2019 09:55**
	SUB_Perch-6850			21 Nov 2019
4.	**HS19110320-04**	**04WW03-191106**	**Water**	**06 Nov 2019 08:20**
	SUB_Perch-6850			21 Nov 2019
5.	**HS19110320-05**	**04WW06-191106**	**Water**	**06 Nov 2019 09:10**
	SUB_Perch-6850			21 Nov 2019
6.	**HS19110320-06**	**04WW11-191106**	**Water**	**06 Nov 2019 09:55**
	SUB_Perch-6850	MS/MSD		21 Nov 2019
7.	**HS19110320-07**	**04WW05-191106**	**Water**	**06 Nov 2019 10:45**
	SUB_Perch-6850			21 Nov 2019
8.	**HS19110320-08**	**04WW08-191106**	**Water**	**06 Nov 2019 11:35**
	SUB_Perch-6850			21 Nov 2019
9.	**HS19110320-09**	**04WW04-191106**	**Water**	**06 Nov 2019 12:20**

Subcontract Chain of Custody

SAMPLING STATE: **Texas** **COC ID:** **12582**

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
	SUB_Perch-6850			21 Nov 2019
10.	**HS19110320-10**	**LHSMW01-191106**	**Water**	**06 Nov 2019 13:15**
	SUB_Perch-6850			21 Nov 2019
11.	**HS19110320-11**	**Fire Station Well-191106**	**Water**	**06 Nov 2019 13:35**
	SUB_Perch-6850			21 Nov 2019

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

HS19110320-06 MS/MSD

QC Level: DOD IV (DoD Data Package)

Relinquished By: _____ Date/Time: 11/7/19 1800

Received By: Jamie Jussee Date/Time: 11/08/19 8:40

Cooler ID(s): _____ Temperature(s): _____

ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: 1931753

Date/Time of Receipt: 11-08-19 8:40

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:						
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	Cooler Condition	Temp.	Cooler Received	Cooler Condition	Temp.	Cooler Received	Cooler Condition	Temp.
1	good	2 °C	4		°C	7		°C
2		°C	5		°C	8		°C
3		°C	6		°C	9		°C

Taken By: Jamie Vanassell (Signature) T. Vanassell (Printed Name) 11-08-19 (Date)

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Residual Chlorine Present
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF RD
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 07NOV19
ACTWGT: 23.35 LB
CAD: 300130/CAFE3211
DIMS: 14x11x10 IN

BILL THIRD PARTY

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS19110320-RJ

FedEx Express

TRK# 0201 **1251 0291 5179**

FRI - 08 NOV 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

10450 Stancliff Rd, Ste 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887
www.alsglobal.com

Purchase Order

PO: HS19110320

VENDOR:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	12582
TSR:	Sonia West

Item	Catalog No	Unit Price	Quantity	Ext Price
1. SUB_Perch-6850	NA	$56.25	11	$618.75
			Order Total:	$618.75

ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS19110320 | ***Split:*** | **Workorder ID:** 1931753 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
1	11/05/2019 08:30	04WW02-191105	1931753001		Water	A	1	A
2	11/05/2019 08:30	04WW02-191105-FD	1931753002	FLDDUP	Water	A	1	A
3	11/05/2019 08:30	LHSMW02-191105	1931753003		Water	A	1	A
4	11/06/2019 08:20	04WW03-191106	1931753004		Water	A	1	A
5	11/06/2019 09:10	04WW06-191106	1931753005		Water	A	1	A
6	11/06/2019 09:55	04WW11-191106	1931753006		Water	A	1	A
7	11/06/2019 09:55	04WW11-191106MS	1931753007	MS	Water	A	1	A
8	11/06/2019 09:55	04WW11-191106MSD	1931753008	MSD	Water	A	1	A
9	11/06/2019 10:45	04WW05-191106	1931753009		Water	A	1	A
10	11/06/2019 11:35	04WW08-191106	1931753010		Water	A	1	A

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	11/08/2019 08:40	ALS Sample Receiving	Sample Login
Julie Warath	11/8/19 1400	R.33.1	storage
R.33.1	11.14.19/12:10	T. Bush	ecoli analysis

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS19110320 | **Split:** | **Workorder ID:** 1931753 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Containers

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	ID(s)	Count	EPA 6850, DoD QSM
11	11/06/2019 12:20	04WW04-191106	1931753011		Water	A	1	A
12	11/06/2019 13:15	LHSMW01-191106	1931753012		Water	A	1	A
13	11/06/2019 13:35	Fire Station Well-191106	1931753013		Water	A	1	A
14								
15								
16								
17								
18								
19								
20								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	11/08/2019 08:40	ALS Sample Receiving	Sample Login
Julie Warath	11/8/19 1400	R.33.1	storage
R.33.1	11.14.19/12:10	T. Busch	CL04 analysis

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

Batch Worklist

Batch: ELMS/ 2319 **Created:** 11/19/2019 07:58 **Instrument:** LCMS04 **HBN:** 252142

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1931753 [ENV_LVL4]
Workorder: 1932010 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	684804	CCV for HBN 252142 [ELMS/2319]				CCV	3		E685041C3Q	5311		11/21/2019	11/19/2019
2	684805	LCS for HBN 252142 [ELMS/2319]				LCS	3		E6850Q413Q	5311		11/21/2019	11/19/2019
3	684807	ICS for HBN 252142 [ELMS/2319]				ICS	3		E6850..D3Q	5311		11/21/2019	11/19/2019
4	684808	LMB for HBN 252142 [ELMS/2319]				LMB	3		E6850Q413Q	5311		11/21/2019	11/19/2019
5	1931753001	04WW02-191105				SAMPLE	3	1931753001-A	E6850Q41.3	5480	12/3/2019	11/21/2019	11/19/2019
6	1931753002	04WW02-191105-FD				FLDDUP	3	1931753002-A	E6850Q41.3	5480	12/3/2019	11/21/2019	11/19/2019
7	1931753003	LHSMW02-191105				SAMPLE	3	1931753003-A	E6850Q41.3	5480	12/3/2019	11/21/2019	11/19/2019
8	1931753004	04WW03-191106				SAMPLE	3	1931753004-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
9	1931753005	04WW06-191106				SAMPLE	3	1931753005-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
10	1931753006	04WW11-191106				SAMPLE	3	1931753006-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
11	1931753007	04WW11-191106MS				MS	3	1931753007-A	E6850Q413Q	5480		11/21/2019	11/19/2019
12	1931753008	04WW1I-191106MSD				MSD	3	1931753008-A	E6850Q413Q	5480		11/21/2019	11/19/2019
13	1931753009	04WW05-191106				SAMPLE	3	1931753009-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
14	1931753010	04WW08-191106				SAMPLE	3	1931753010-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
15	684809	CCV for HBN 252142 [ELMS/2319]				CCV	3		E685041C3Q	5311		11/21/2019	11/19/2019
16	1931753011	04WW04-191106				SAMPLE	3	1931753011-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
17	1931753012	LHSMW01-191106				SAMPLE	3	1931753012-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
18	1931753013	Fire Station Well-191106				SAMPLE	3	1931753013-A	E6850Q41.3	5480	12/4/2019	11/21/2019	11/19/2019
19	1932010001	50WW21-191108				SAMPLE	3	1932010001-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
20	1932010002	50WW24-191108				SAMPLE	3	1932010002-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
21	1932010003	50WW27-191108				SAMPLE	3	1932010003-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
22	1932010004	50WW15-191108				SAMPLE	3	1932010004-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
23	1932010005	50WW05-191108				SAMPLE	3	1932010005-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
24	1932010006	50WW18-191108				SAMPLE	3	1932010006-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
25	1932010007	50WW17-191108				SAMPLE	3	1932010007-A	E6850Q41.3	5480	12/6/2019	11/25/2019	11/19/2019
26	684806	RLVS for HBN 252142 [ELMS/2319				RLVS	3		E685041C3Q	5311		11/21/2019	
27	684810	CCV for HBN 252142 [ELMS/2319]				CCV	3		E685041C3Q	5311		11/21/2019	11/19/2019

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

Analyst Write-up

ALS Work Order #'s & Sample #( )'s: 1931753 (001-13); 1932010 (001-07)
ELMS Batch/HBN ID: 2319 (252142)
Prep Date: 11/14,19/2019 Analysis Date: 11/19/2019 Analyst: Tom Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2019\NOV\19NOV19D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by Tom Bosch. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/5%ACN (B&J Lot DU461-US)/0.1% glacial acetic acid (JT-Baker Lot 122550).
Eluent B1: 95% ACN (B&J Lot DU461-US)/5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 122550).

STANDARDS: Internal Standard Spiking Solution Horizon# 47863. Dilutions of Working Standards (Horizon: 49947/48) used for ICAL, CCV's, RLVS and ICS.

CALIBRATION CURVE: Used curve from 09/20/2019, sequence 20SEP19D.s Offline Quantitation Method: CLO4-DP3.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 7 Injection Volume: 30µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1 Run time: 12.0min.

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.65
5.8	0.65
5.9	0.25
10.3	0.25
10.5	0.65
12.0	0.65

QC DATA: 3.0µL of QC Solution Horizon ID 47516 was used for LCS 684805; Target = 3.0µg/L. ASTM type II water was used for LMB 684808.

MS/MSD: The Matrix Spike and duplicate (MS/MSD) was performed on samples 1931753007/08 (Client ID's: 04WW01-191106. 3.0µl of Working Standard Solution Horizon ID 49947 was added to 10.0mL of sample preparation. Spike target = 3.0µg/L.

COMMENTS:
1) Results reported in µg/L.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2019\NOV\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2019\252142-DoD-ALS-Hstn LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#
5) The Reporting Limit Verification Standard (RLVS – 684806) is reported from the analysis of the Laboratory Control Sample (LCS – 684805) at a level of 3.0µg/L.
6) Due to limitations of the Chemstation Software, some of the chromatographic peaks require manual integration. Manual Integrations were performed for one of the Initial Calibration analyses (datafile: 20SEPI03) along with datafile 19OCT19D02.

5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS: 2319 HBN: 252142 **Sample Set IDs if Applicable:** 1931753 / 1932010	**Analyst Initials**	**Reviewer Initials**
Sample positions on autosampler verified against instrument sequence	TB	NA
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#_____	TB	SB
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK	Description - Perchlorate ISTD Wrk 1,000ug/L

Standard:	49946	**Created By:**	Thomas Bosch	**Amount:**	25 mL
MFG:	ALS/SLC	**Create Date:**	09/23/2019 03:09PM	**Expires:**	09/19/2020
MFG Lot:	TNB: 09/20/2019	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Pipette ID:	Not Provided	**Verify Date:**		**Lab Lot:**	CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
47863	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	12/05/2028

STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 47863	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 05/23/2019 10:05AM	**Expires:** 12/05/2028
MFG Lot: SDIH-016	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 49948
MFG: ALS/SLC
MFG Lot: TNB: 09/20/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/20/2019 03:09PM

Amount: 10 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
49947	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	07/25/2020

STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK — **Description - 6850 Stock AccStd 1,000ug/mL**

Standard: 43659
MFG: AccuStandard
MFG Lot: 218065075
Part ID: IC-PER-10X-1

Created By: Thomas Bosch
Create Date: 09/17/2018 09:09AM

Amount: 100 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/mL

STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O	Description - ASTM Type II Water

Standard:	**109**	**Created By:**	ALS Support (Lims)	**Amount:**	1000 L
MFG:	DCL In House	**Create Date:**	10/06/2005 09:10AM	**Expires:**	11/07/2025
MFG Lot:	Not Provided			**Usable:**	Yes
Part ID:	Not Provided			**Lab Lot:**	LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 49947
MFG: ALS/SLC
MFG Lot: TNB: 09/20/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/23/2019 03:09PM

Amount: 10 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 47516
MFG: ALS/SLC
MFG Lot: TNB: 05/06/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/06/2019 03:05PM

Amount: 10 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
47515	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	03/31/2020

STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O	Description - ASTM Type II Water

Standard:	109	**Created By:**	ALS Support (Lims)	**Amount:**	1000 L
MFG:	DCL In House	**Create Date:**	10/06/2005 09:10AM	**Expires:**	11/07/2025
MFG Lot:	Not Provided			**Usable:**	Yes
Part ID:	Not Provided			**Lab Lot:**	LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK	Description - 6850 QC Stock STD 1,000ug/mL

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 47515
MFG: ALS/SLC
MFG Lot: TNB: 05/06/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/06/2019 03:05PM

Amount: 10 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

125 Market Street
New Haven, CT 06513
USA

AccuStandard®

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CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)

Included on ISO/IEC 17025 Scope of Accreditation: Yes

Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.

The final solution was checked against an independent standard to verify its concentration.

We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.

All solutions are filtered through a 0.2 µm filter prior to being bottled.

All glassware used in preparation is Class A and calibrated regularly.

All weights are traceable through NIST, Test No. 822-275872-11

All bottles are triple rinsed with deionized water prior to use.

Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.

We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

AccuStandard

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

TRIPLE ISO CERTIFICATION ISO 17025 • ISO GUIDE 34 • ISO 9001 ULTRA

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

S 36748

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ISO 9001 Registered Quality System – TUV USA

250 SMITH STREET • NORTH KINGSTOWN, RHODE ISLAND 02852 • WWW.ULTRASCI.COM

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

TRIPLE ISO CERTIFICATION ULTRA ISO 17025 • ISO GUIDE 34 • ISO 9001

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ISO 9001 Registered Quality System – TUV USA

250 SMITH STREET • NORTH KINGSTOWN, RHODE ISLAND 02852 • WWW.ULTRASCI.COM

Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

S 47863

Product Name: (Isotopic Label & Enrichment Specification) PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER

Lot Number: SDIH-016

Catalog Number: OLM-7310-S

Product Information

Chemical Purity Specification:	≥ 98%
MW*: * *For isotopically labeled compounds, MW listed is for the fully enriched product.*	130.44
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

$NaCl^{18}O_4$

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated. CIL Certificates of Analysis are occasionally updated with new data following recertification. We recommend checking the website for the latest version.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number . Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

Approved by: Sashi Sivendran-Basak

Sashi Sivendran-Basak, Ph.D., Quality Review

Quality Control Tests and Results

QC Release Date	12/05/2018
Expiration Date	12/05/2028
Concentration Based on Gravimetry	100.0 ± 1.0 µg/mL (k=2)
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	105.4 ± 1.1 µg/mL (k=2)

CIL subscribes to the following standards for different products: ISO Guide 34, ISO/IEC 17025, ISO 13485 and cGMP as appropriate.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

Batch Report: C:\HPCHEM\1\DATA\19NOV19D\19NOV19S.B

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP3.M

['#' ==> Run has not been reprocessed with Batch Review Method
'*' ==> Run has been saved with batch file]

#*	Sample	Location	Inj	SampleType	Run	Perchlorate Area	Perchlorat RT	Perchlorate Amount
*	684804 CCV@25	Vial 71	1	Control	1	1.11549e6	7.375	25.70542
*	684805 QC@3.0	Vial 72	1	Control	2	1.57343e5	7.389	2.81132
*	684807 ICS@3.0	Vial 73	1	Control	3	9.81343e4	7.227	2.70044
*	684808 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000
*	1931753001	Vial 75	1	Sample	5	0.00000	0.000	0.00000
*	1931753002	Vial 76	1	Sample	6	0.00000	0.000	0.00000
*	1931753003	Vial 77	1	Sample	7	0.00000	0.000	0.00000
*	1931753004	Vial 78	1	Sample	8	0.00000	0.000	0.00000
*	1931753005	Vial 79	1	Sample	9	0.00000	0.000	0.00000
*	1931753006	Vial 80	1	Sample	10	0.00000	0.000	0.00000
*	1931753007 MS	Vial 81	1	Sample	11	1.30769e5	7.199	2.72098
*	1931753008 MSD	Vial 82	1	Sample	12	1.27060e5	7.171	2.94244
*	1931753009	Vial 83	1	Sample	13	0.00000	0.000	0.00000
*	1931753010	Vial 84	1	Sample	14	4.91726e5	7.095	13.36216
*	684809 CCV@25	Vial 71	1	Control	15	9.31289e5	7.389	24.67348
*	1931753011	Vial 85	1	Sample	16	0.00000	0.000	0.00000
*	1931753012	Vial 86	1	Sample	17	0.00000	0.000	0.00000
*	1931753013	Vial 87	1	Sample	18	0.00000	0.000	0.00000
*	1932010001	Vial 88	1	Sample	19	0.00000	0.000	0.00000
*	1932010002	Vial 89	1	Sample	20	0.00000	0.000	0.00000
*	1932010003	Vial 90	1	Sample	21	0.00000	0.000	0.00000
*	1932010004	Vial 91	1	Sample	22	0.00000	0.000	0.00000
*	1932010005	Vial 92	1	Sample	23	0.00000	0.000	0.00000
*	1932010006	Vial 93	1	Sample	24	0.00000	0.000	0.00000
*	1932010007	Vial 94	1	Sample	25	0.00000	0.000	0.00000
*	684810 CCV@25	Vial 71	1	Control	26	9.08551e5	7.429	24.23157

#*	Sample	Location	Inj	SampleType	Run	CLO4-89-ISTD Area	CLO4-89-IS RT	CLO4-89-ISTD Amount
*	684804 CCV@25	Vial 71	1	Control	1	1.47847e5	7.396	5.00000
*	684805 QC@3.0	Vial 72	1	Control	2	2.05736e5	7.412	5.00000
*	684807 ICS@3.0	Vial 73	1	Control	3	1.33496e5	7.255	5.00000
*	684808 LMB	Vial 74	1	Control	4	1.53147e5	7.417	5.00000
*	1931753001	Vial 75	1	Sample	5	1.89772e5	7.293	5.00000
*	1931753002	Vial 76	1	Sample	6	1.71402e5	7.294	5.00000
*	1931753003	Vial 77	1	Sample	7	1.69955e5	7.124	5.00000
*	1931753004	Vial 78	1	Sample	8	1.72551e5	7.195	5.00000
*	1931753005	Vial 79	1	Sample	9	1.42815e5	7.006	5.00000
*	1931753006	Vial 80	1	Sample	10	1.77283e5	7.209	5.00000
*	1931753007 MS	Vial 81	1	Sample	11	1.76570e5	7.222	5.00000
*	1931753008 MSD	Vial 82	1	Sample	12	1.58843e5	7.200	5.00000
*	1931753009	Vial 83	1	Sample	13	1.48965e5	7.198	5.00000
*	1931753010	Vial 84	1	Sample	14	1.31911e5	7.114	5.00000
*	684809 CCV@25	Vial 71	1	Control	15	1.29143e5	7.405	5.00000
*	1931753011	Vial 85	1	Sample	16	1.57073e5	7.174	5.00000
*	1931753012	Vial 86	1	Sample	17	1.56727e5	7.325	5.00000
*	1931753013	Vial 87	1	Sample	18	1.16312e5	7.227	5.00000
*	1932010001	Vial 88	1	Sample	19	1.18044e5	6.887	5.00000
*	1932010002	Vial 89	1	Sample	20	1.30569e5	7.171	5.00000
*	1932010003	Vial 90	1	Sample	21	1.33641e5	7.163	5.00000
*	1932010004	Vial 91	1	Sample	22	1.24695e5	7.109	5.00000
*	1932010005	Vial 92	1	Sample	23	1.43110e5	7.154	5.00000
*	1932010006	Vial 93	1	Sample	24	1.12592e5	7.082	5.00000
*	1932010007	Vial 94	1	Sample	25	1.22348e5	7.114	5.00000
*	684810 CCV@25	Vial 71	1	Control	26	1.28522e5	7.458	5.00000

Batch Report: C:\HPCHEM\1\DATA\19NOV19D\19NOV19S.B

#*	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
*	684804 CCV@25	Vial 71	1	Control	1	3.31757e5	7.394	25.13176
*	684805 QC@3.0	Vial 72	1	Control	2	5.33816e4	7.396	3.04097
*	684807 ICS@3.0	Vial 73	1	Control	3	3.51191e4	7.259	3.08495
*	684808 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000
*	1931753001	Vial 75	1	Sample	5	0.00000	0.000	0.00000
*	1931753002	Vial 76	1	Sample	6	0.00000	0.000	0.00000
*	1931753003	Vial 77	1	Sample	7	0.00000	0.000	0.00000
*	1931753004	Vial 78	1	Sample	8	0.00000	0.000	0.00000
*	1931753005	Vial 79	1	Sample	9	0.00000	0.000	0.00000
*	1931753006	Vial 80	1	Sample	10	0.00000	0.000	0.00000
*	1931753007 MS	Vial 81	1	Sample	11	4.43687e4	7.202	2.94112
*	1931753008 MSD	Vial 82	1	Sample	12	4.43897e4	7.197	3.28446
*	1931753009	Vial 83	1	Sample	13	0.00000	0.000	0.00000
*	1931753010	Vial 84	1	Sample	14	1.59614e5	7.112	14.10318
*	684809 CCV@25	Vial 71	1	Control	15	2.87274e5	7.401	24.93224
*	1931753011	Vial 85	1	Sample	16	0.00000	0.000	0.00000
*	1931753012	Vial 86	1	Sample	17	0.00000	0.000	0.00000
*	1931753013	Vial 87	1	Sample	18	0.00000	0.000	0.00000
*	1932010001	Vial 88	1	Sample	19	0.00000	0.000	0.00000
*	1932010002	Vial 89	1	Sample	20	0.00000	0.000	0.00000
*	1932010003	Vial 90	1	Sample	21	0.00000	0.000	0.00000
*	1932010004	Vial 91	1	Sample	22	0.00000	0.000	0.00000
*	1932010005	Vial 92	1	Sample	23	0.00000	0.000	0.00000
*	1932010006	Vial 93	1	Sample	24	0.00000	0.000	0.00000
*	1932010007	Vial 94	1	Sample	25	0.00000	0.000	0.00000
*	684810 CCV@25	Vial 71	1	Control	26	2.85245e5	7.448	24.88059

*** End of Report ***

Sequence: C:\HPCHEM\1\SEQUENCE\CLO4\2019\NOV\19NOV19D.S

Sequence Table:

Method and Injection Info Part:

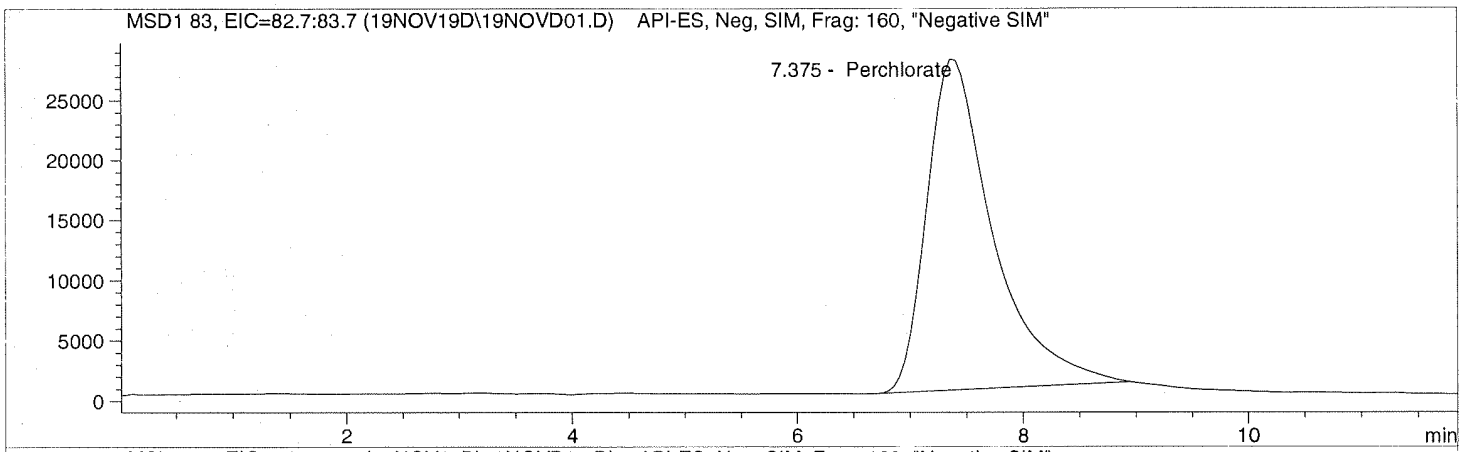
Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	684804 CCV@25	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	684805 QC@3.0	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	684807 ICS@3.0	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	684808 LMB	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	1931753001	CLO4-AQN	1	Sample		
6	Vial 76	1931753002	CLO4-AQN	1	Sample		
7	Vial 77	1931753003	CLO4-AQN	1	Sample		
8	Vial 78	1931753004	CLO4-AQN	1	Sample		
9	Vial 79	1931753005	CLO4-AQN	1	Sample		
10	Vial 80	1931753006	CLO4-AQN	1	Sample		
11	Vial 81	1931753007 MS	CLO4-AQN	1	Sample		
12	Vial 82	1931753008 MSD	CLO4-AQN	1	Sample		
13	Vial 83	1931753009	CLO4-AQN	1	Sample		
14	Vial 84	1931753010	CLO4-AQN	1	Sample		
15	Vial 71	684809 CCV@25	CLO4-AQN	1	Ctrl Samp		
16	Vial 85	1931753011	CLO4-AQN	1	Sample		
17	Vial 86	1931753012	CLO4-AQN	1	Sample		
18	Vial 87	1931753013	CLO4-AQN	1	Sample		
19	Vial 88	1932010001	CLO4-AQN	1	Sample		
20	Vial 89	1932010002	CLO4-AQN	1	Sample		
21	Vial 90	1932010003	CLO4-AQN	1	Sample		
22	Vial 91	1932010004	CLO4-AQN	1	Sample		
23	Vial 92	1932010005	CLO4-AQN	1	Sample		
24	Vial 93	1932010006	CLO4-AQN	1	Sample		
25	Vial 94	1932010007	CLO4-AQN	1	Sample		
26	Vial 71	684810 CCV@25	CLO4-AQN	1	Ctrl Samp		

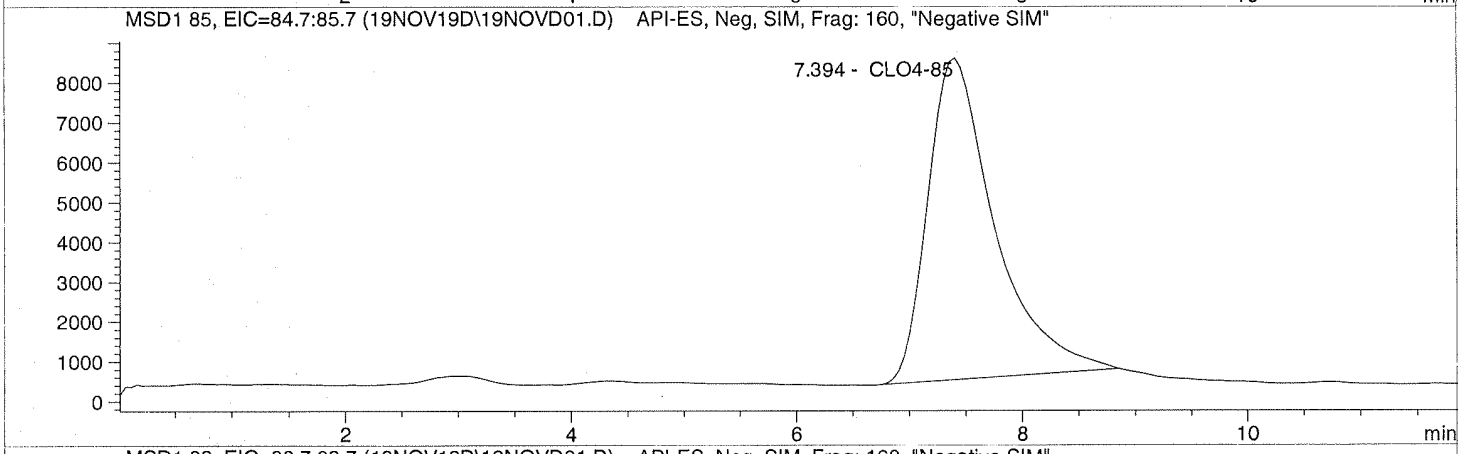
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD01.D Sample Name: 684804 CCV@25

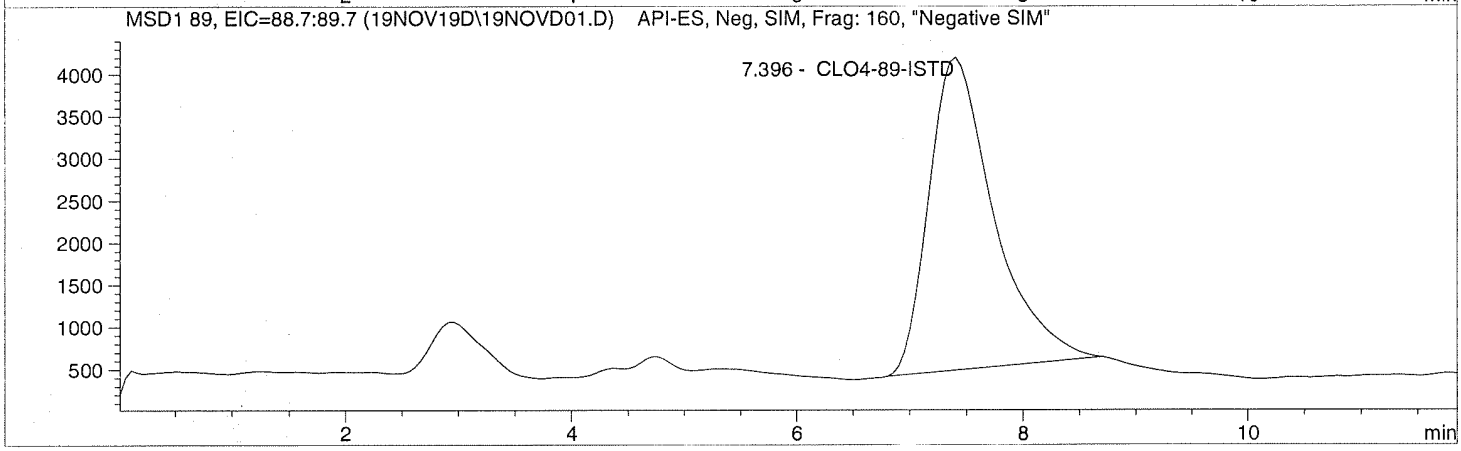
Injection Date:	11/19/2019 08:46:14	Seq Line:	1
Sample Name:	684804 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD01.D Sample Name: 684804 CCV@25

Injection Date:	11/19/2019 08:46:14	Seq Line:	1
Sample Name:	684804 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.375	PBA	1115487.1	25.7054	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.394	PBA	331756.7	25.1318	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.396	PBA	147846.5	5.0000	CLO4-89-ISTD

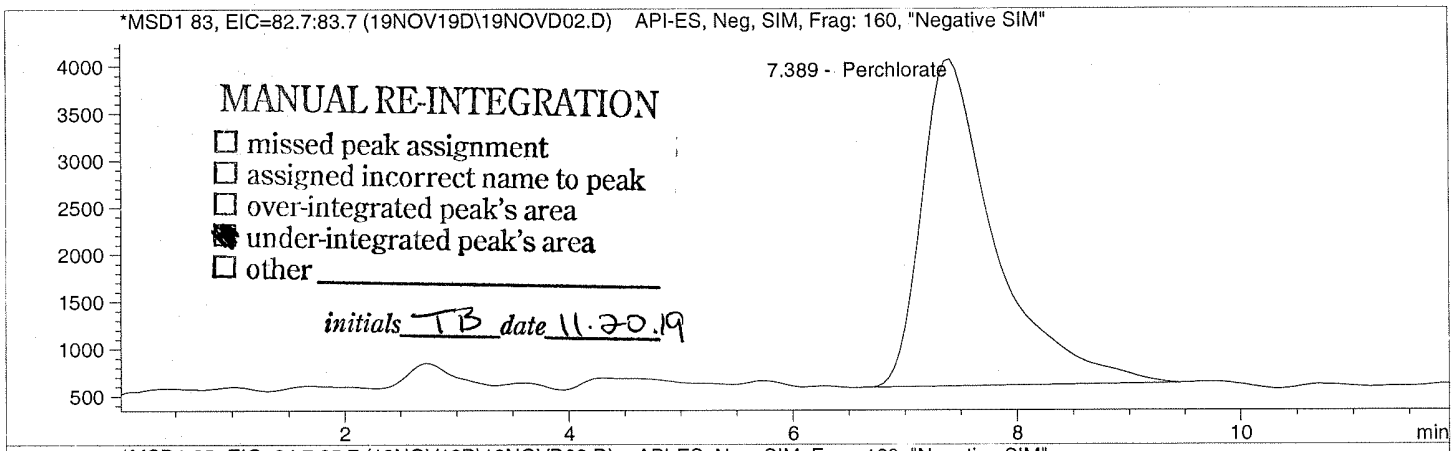
*** End of Report ***

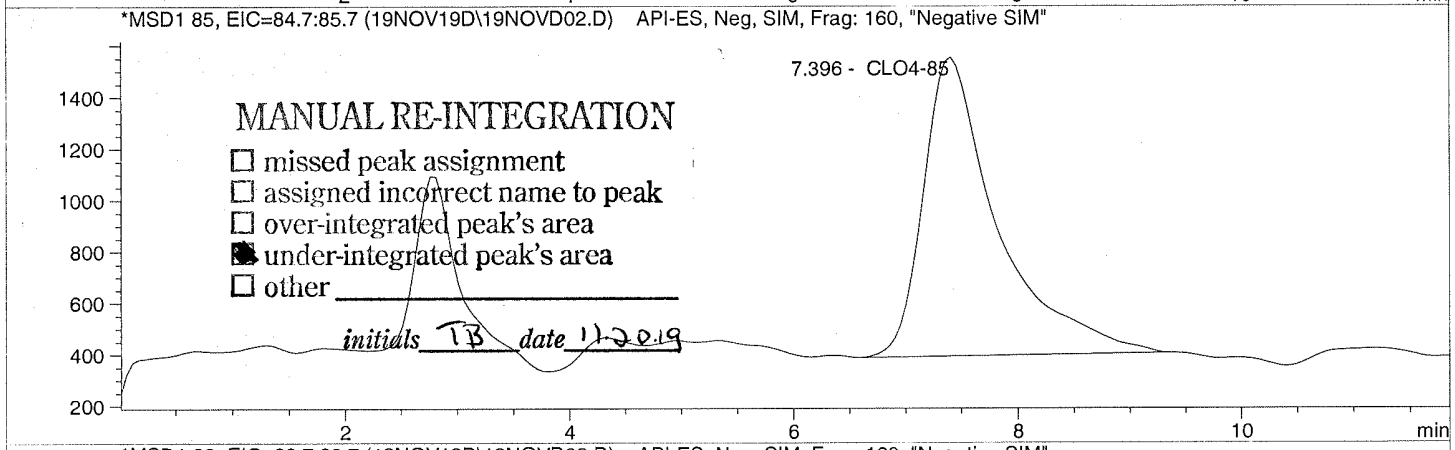
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD02.D Sample Name: 684805 QC@3.0

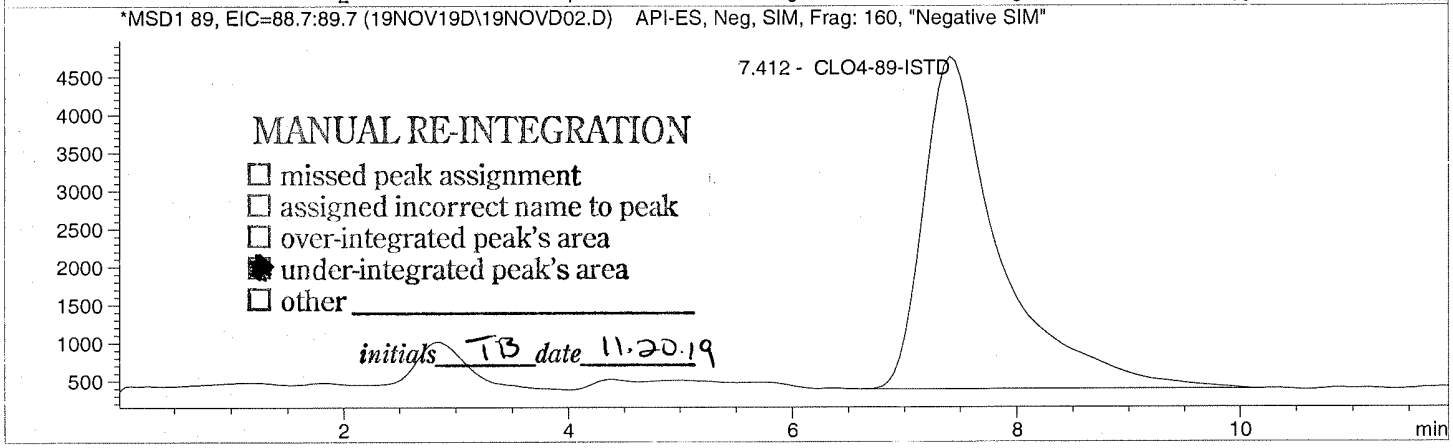
Injection Date:	11/19/2019 09:04:34	Seq Line:	2
Sample Name:	684805 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD02.D Sample Name: 684805 QC@3.0

Injection Date:	11/19/2019 09:04:34	Seq Line:	2
Sample Name:	684805 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	3.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.389	MM	157343.1	2.8113	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.396	MM	53381.6	3.0410	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.412	MM	205736.2	5.0000	CLO4-89-ISTD

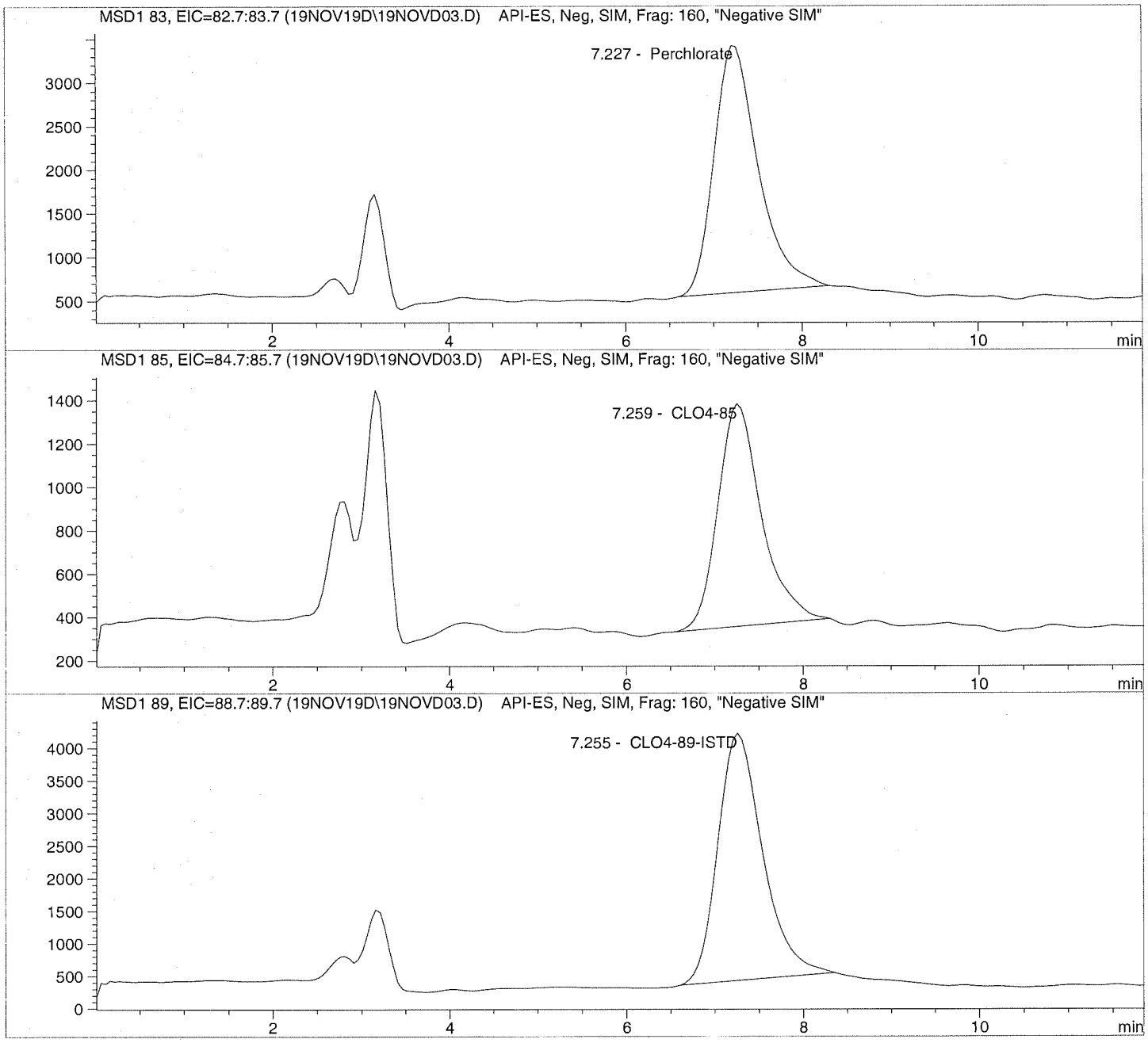
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD03.D Sample Name: 684807 ICS@3.0

Injection Date:	11/19/2019 09:18:20	Seq Line:	3
Sample Name:	684807 ICS@3.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD03.D Sample Name: 684807 ICS@3.0

Injection Date:	11/19/2019 09:18:20	Seq Line:	3
Sample Name:	684807 ICS@3.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	3.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.227	BBA	98134.3	2.7004	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.259	PBA	35119.1	3.0849	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.255	PBA	133495.5	5.0000	CLO4-89-ISTD

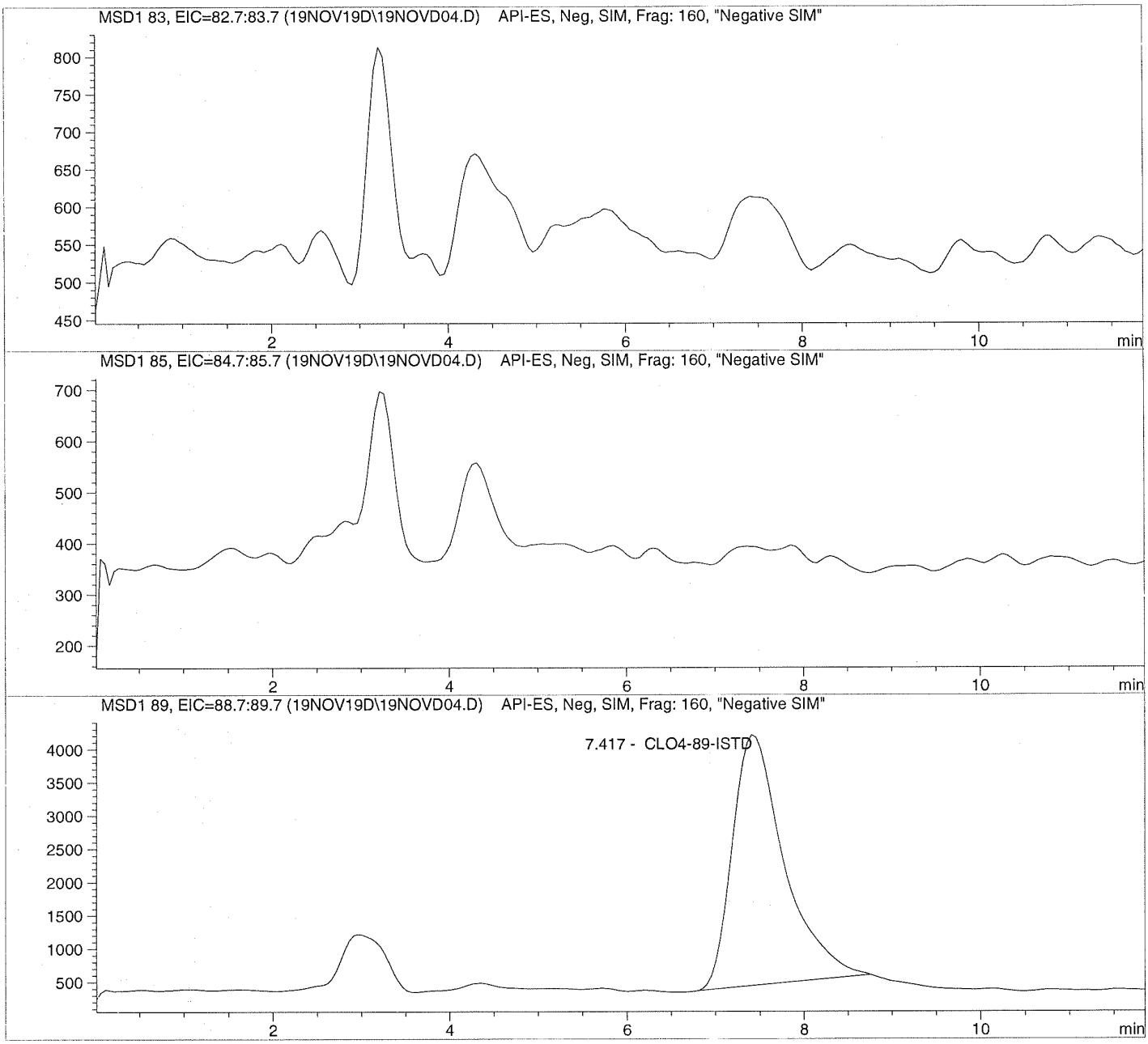
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD04.D Sample Name: 684808 LMB

Injection Date:	11/19/2019 09:32:09	Seq Line:	4
Sample Name:	684808 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD04.D Sample Name: 684808 LMB

Injection Date:	11/19/2019 09:32:09	Seq Line:	4
Sample Name:	684808 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.417	PBA	153146.8	5.0000	CLO4-89-ISTD

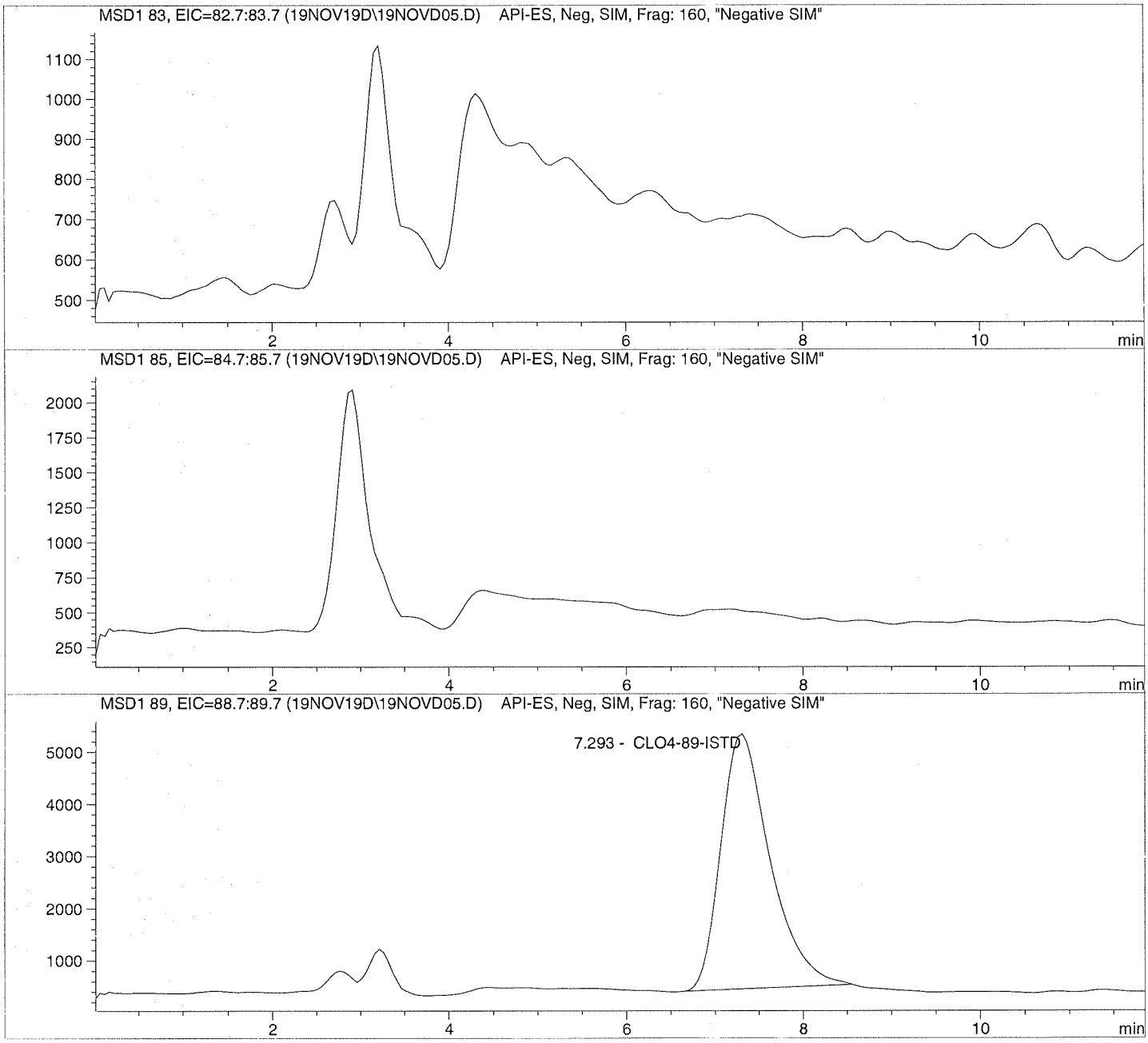
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD05.D Sample Name: 1931753001

Injection Date:	11/19/2019 09:45:57	Seq Line:	5
Sample Name:	1931753001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD05.D Sample Name: 1931753001

Injection Date:	11/19/2019 09:45:57	Seq Line:	5
Sample Name:	1931753001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.293	PBA	189772.2	5.0000	CLO4-89-ISTD

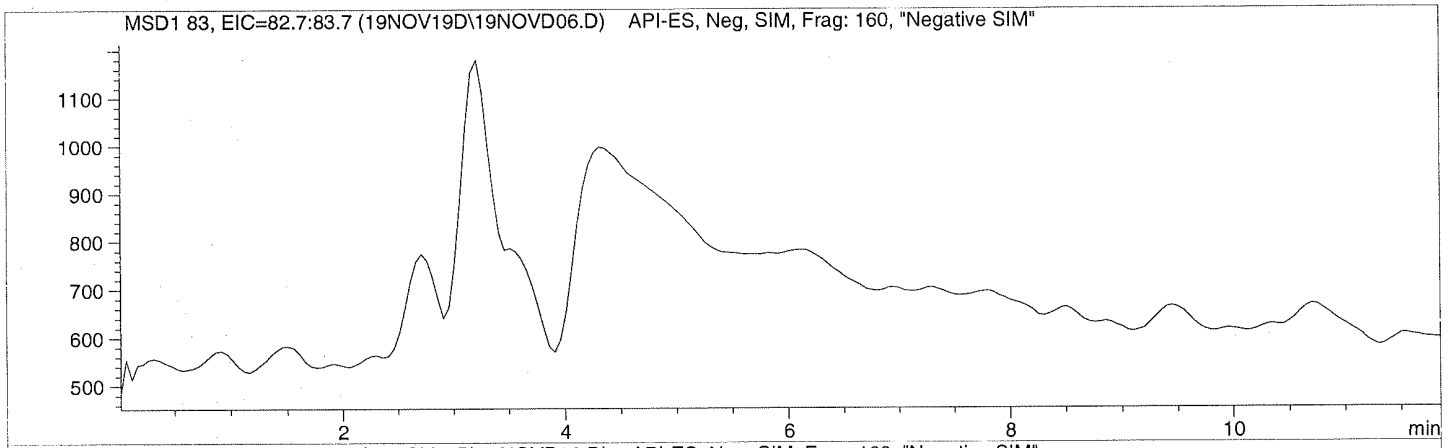
*** End of Report ***

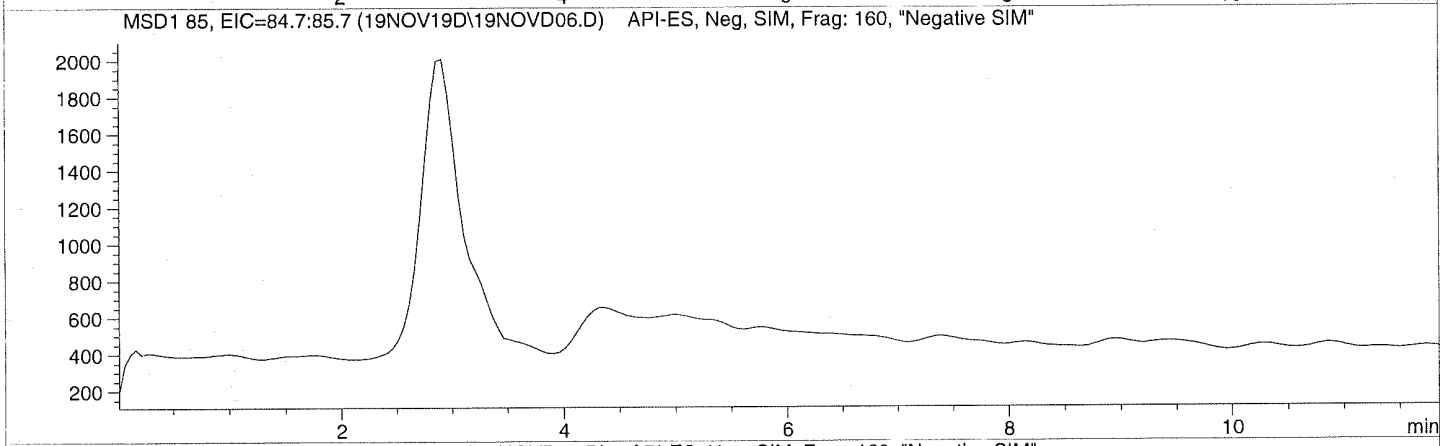
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD06.D Sample Name: 1931753002

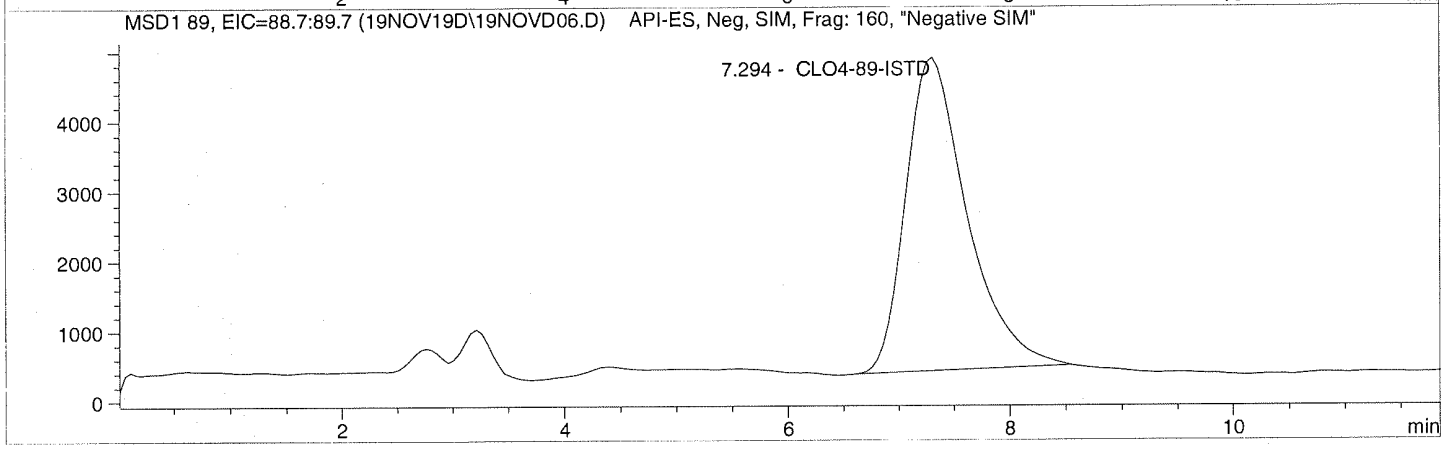
Injection Date:	11/19/2019 09:59:43	Seq Line:	6
Sample Name:	1931753002	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD06.D Sample Name: 1931753002

Injection Date:	11/19/2019 09:59:43	Seq Line:	6
Sample Name:	1931753002	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.294	PBA	171402.0	5.0000	CLO4-89-ISTD

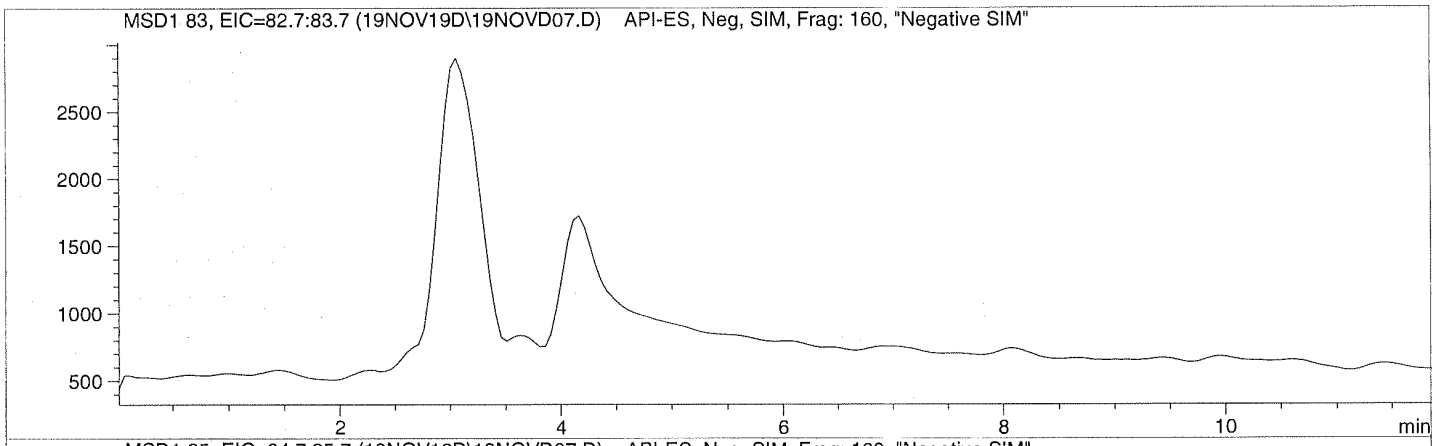
*** End of Report ***

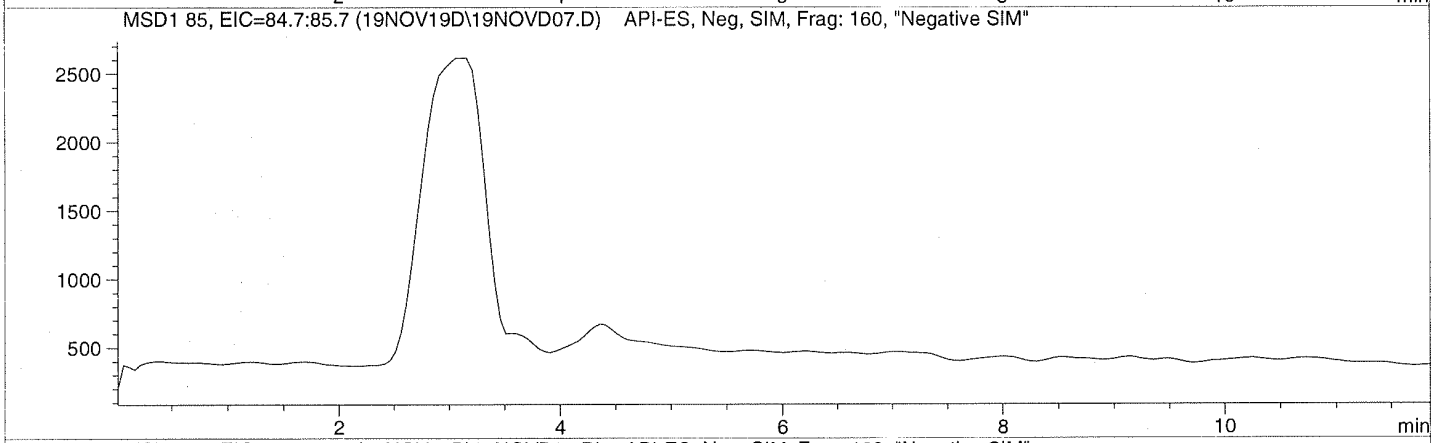
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD07.D Sample Name: 1931753003

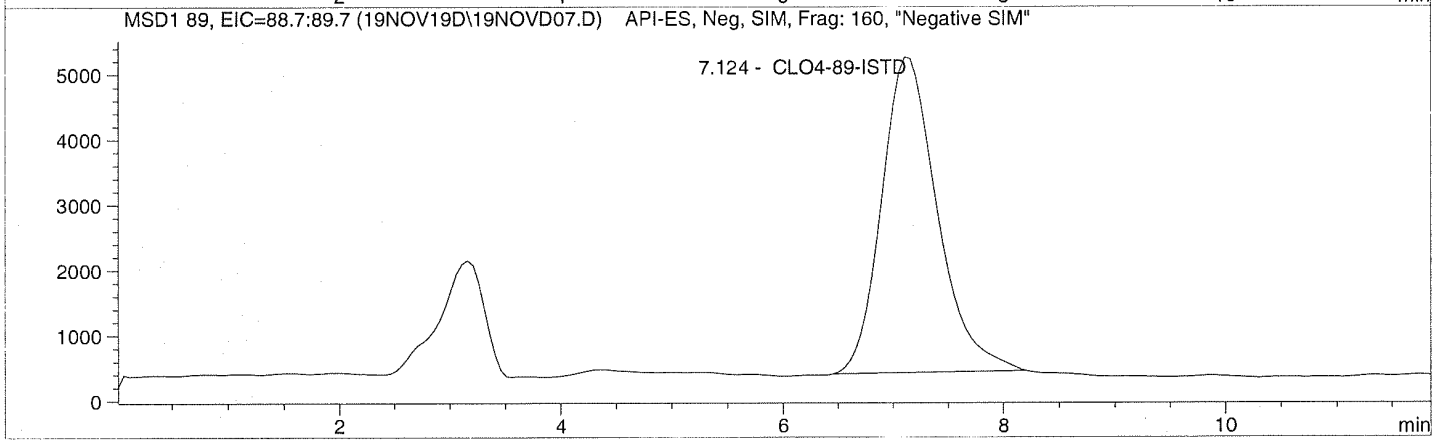
Injection Date:	11/19/2019 10:13:33	Seq Line:	7
Sample Name:	1931753003	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD07.D Sample Name: 1931753003

Injection Date:	11/19/2019 10:13:33	Seq Line:	7
Sample Name:	1931753003	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.124	PBA	169954.7	5.0000	CLO4-89-ISTD

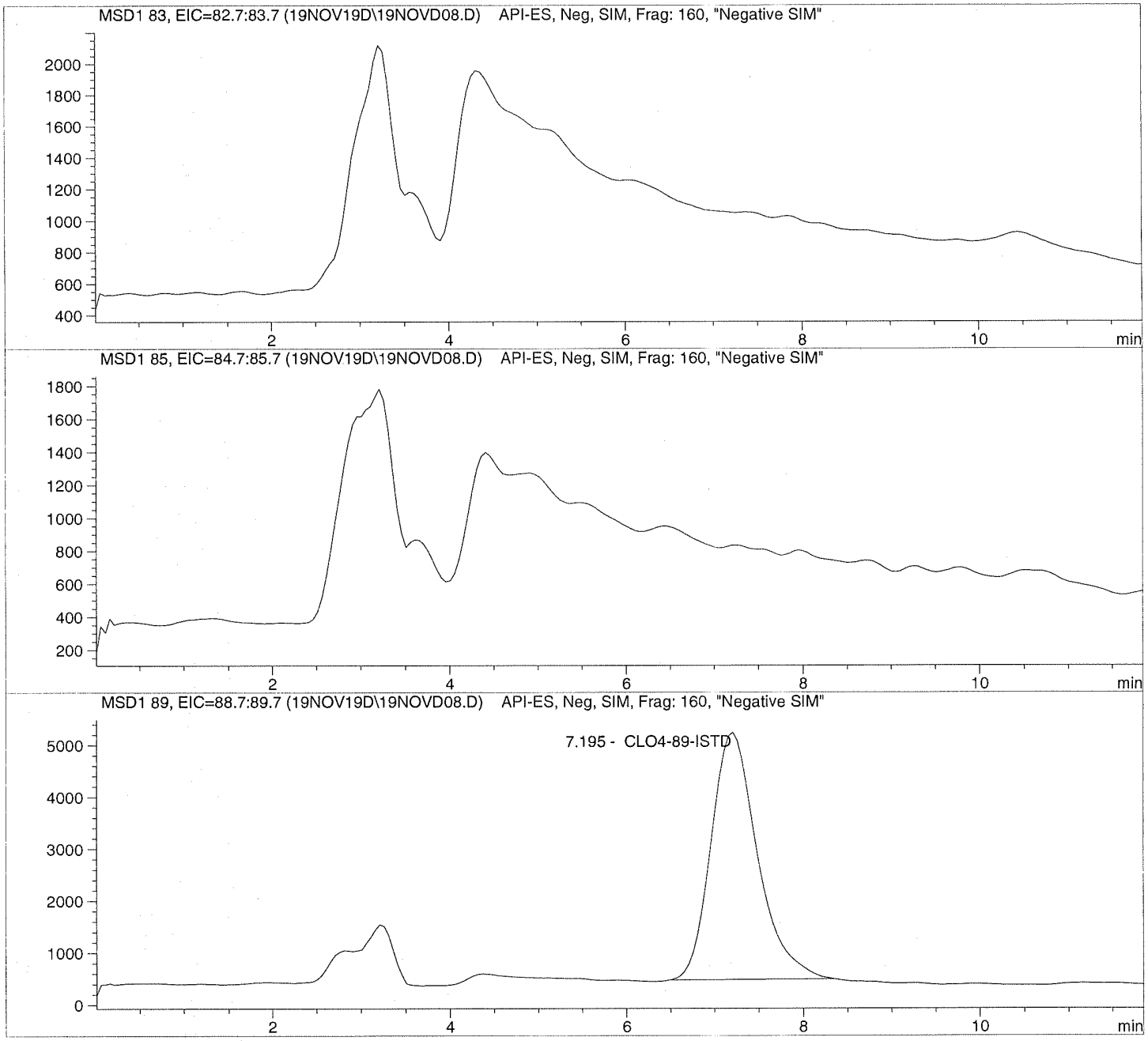
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD08.D Sample Name: 1931753004

Injection Date:	11/19/2019 10:27:21	Seq Line:	8
Sample Name:	1931753004	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD08.D Sample Name: 1931753004

Injection Date:	11/19/2019 10:27:21	Seq Line:	8
Sample Name:	1931753004	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.195	BBA	172551.3	5.0000	CLO4-89-ISTD

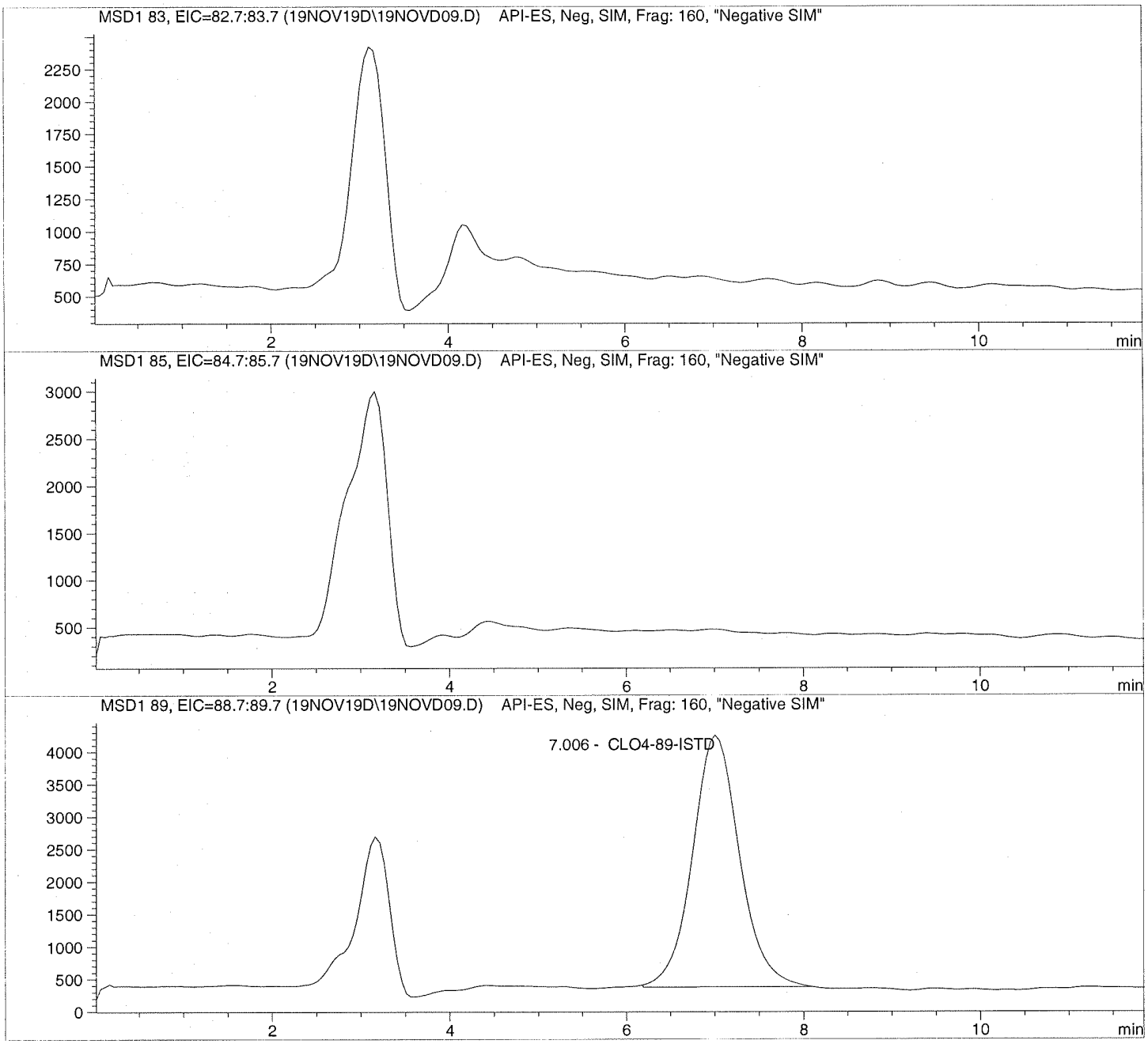
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD09.D Sample Name: 1931753005

Injection Date:	11/19/2019 10:41:09	Seq Line:	9
Sample Name:	1931753005	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD09.D Sample Name: 1931753005

Injection Date:	11/19/2019 10:41:09	Seq Line:	9
Sample Name:	1931753005	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.006	BBA	142814.7	5.0000	CLO4-89-ISTD

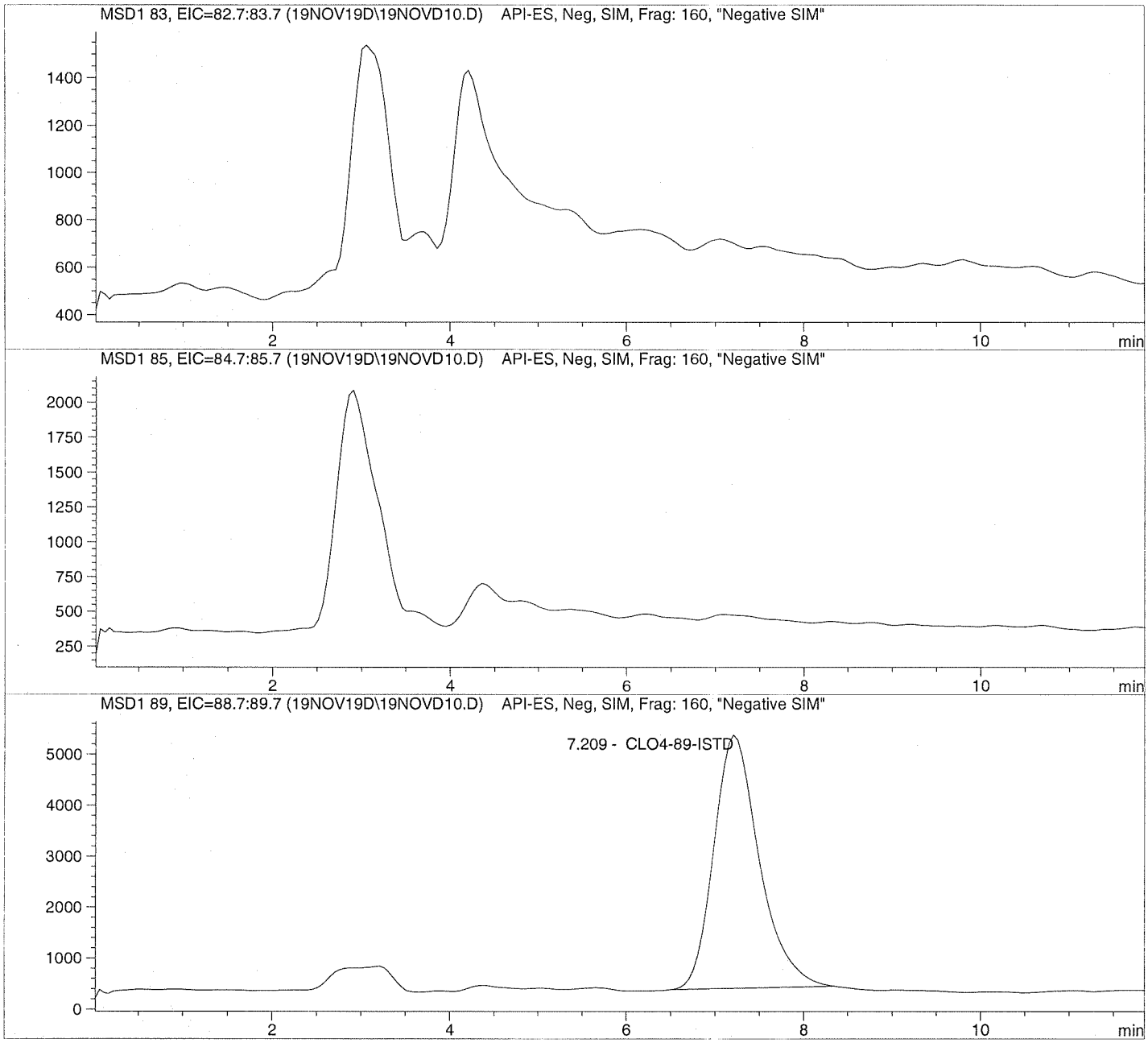
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD10.D Sample Name: 1931753006

Injection Date:	11/19/2019 10:55:02	Seq Line:	10
Sample Name:	1931753006	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD10.D Sample Name: 1931753006

Injection Date:	11/19/2019 10:55:02	Seq Line:	10
Sample Name:	1931753006	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.209	PBA	177283.0	5.0000	CLO4-89-ISTD

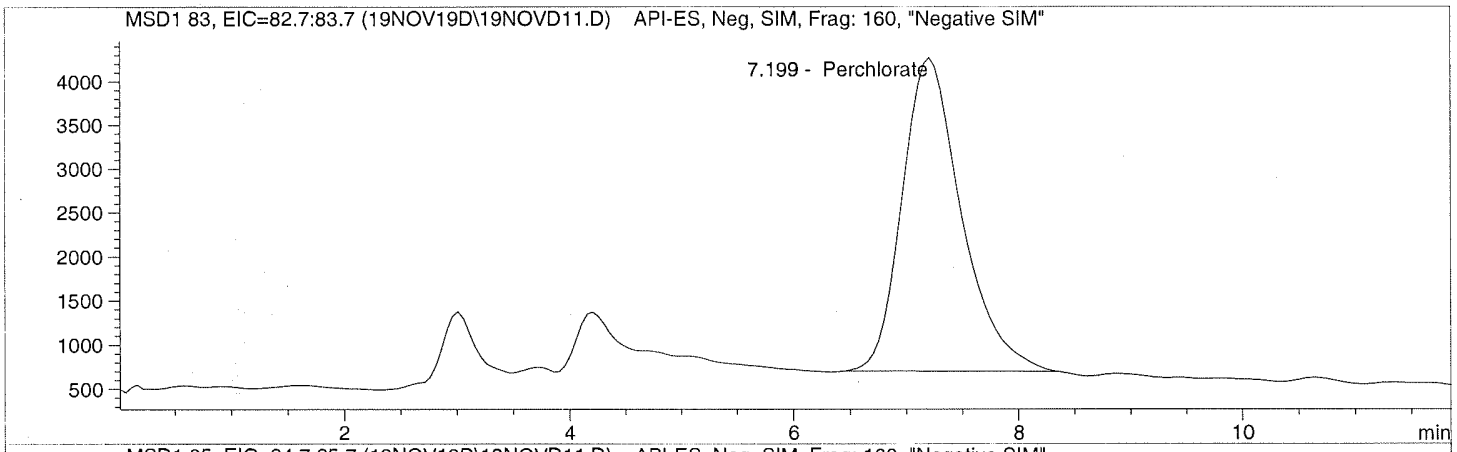
*** End of Report ***

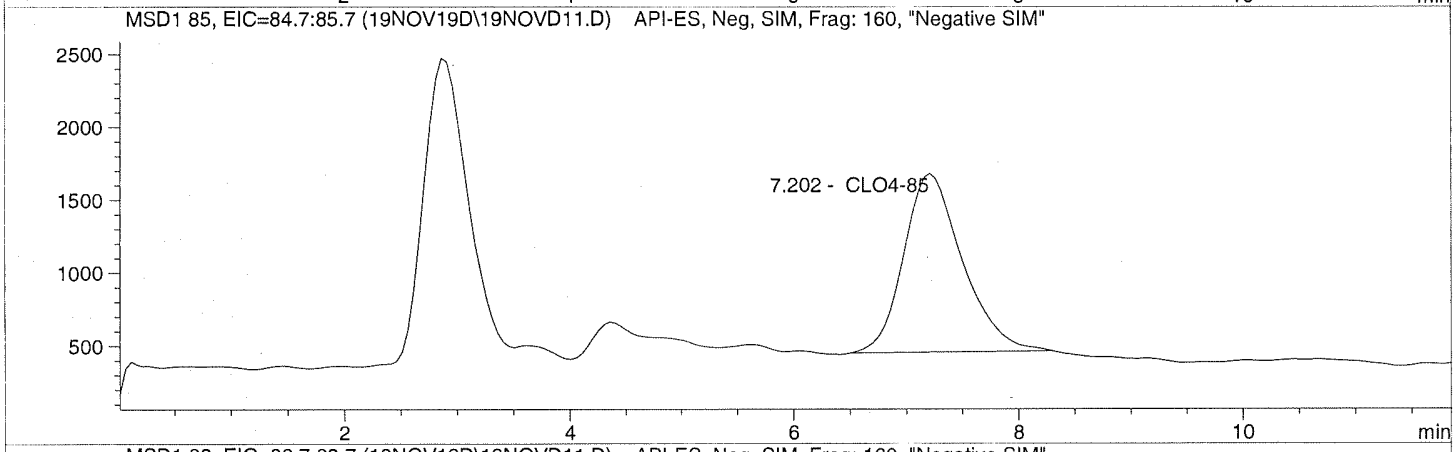
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD11.D Sample Name: 1931753007 MS

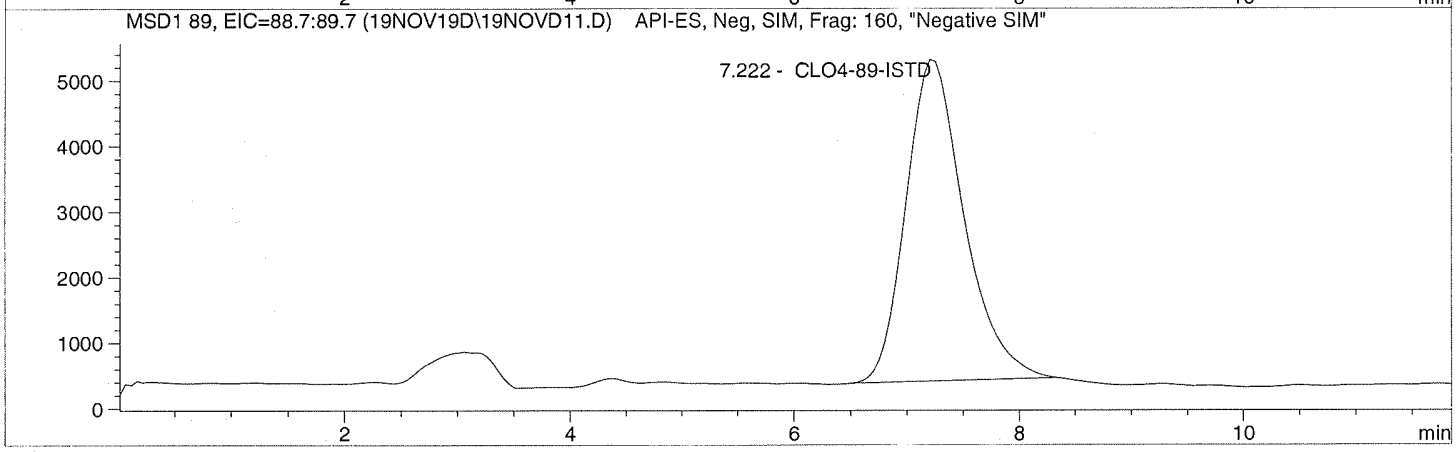
Injection Date:	11/19/2019 11:08:49	Seq Line:	11
Sample Name:	1931753007 MS	Location:	Vial 81
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD11.D Sample Name: 1931753007 MS

Injection Date:	11/19/2019 11:08:49	Seq Line:	11
Sample Name:	1931753007 MS	Location:	Vial 81
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.199	PBA	130769.1	2.7210	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.202	PBA	44368.7	2.9411	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.222	PBA	176570.0	5.0000	CLO4-89-ISTD

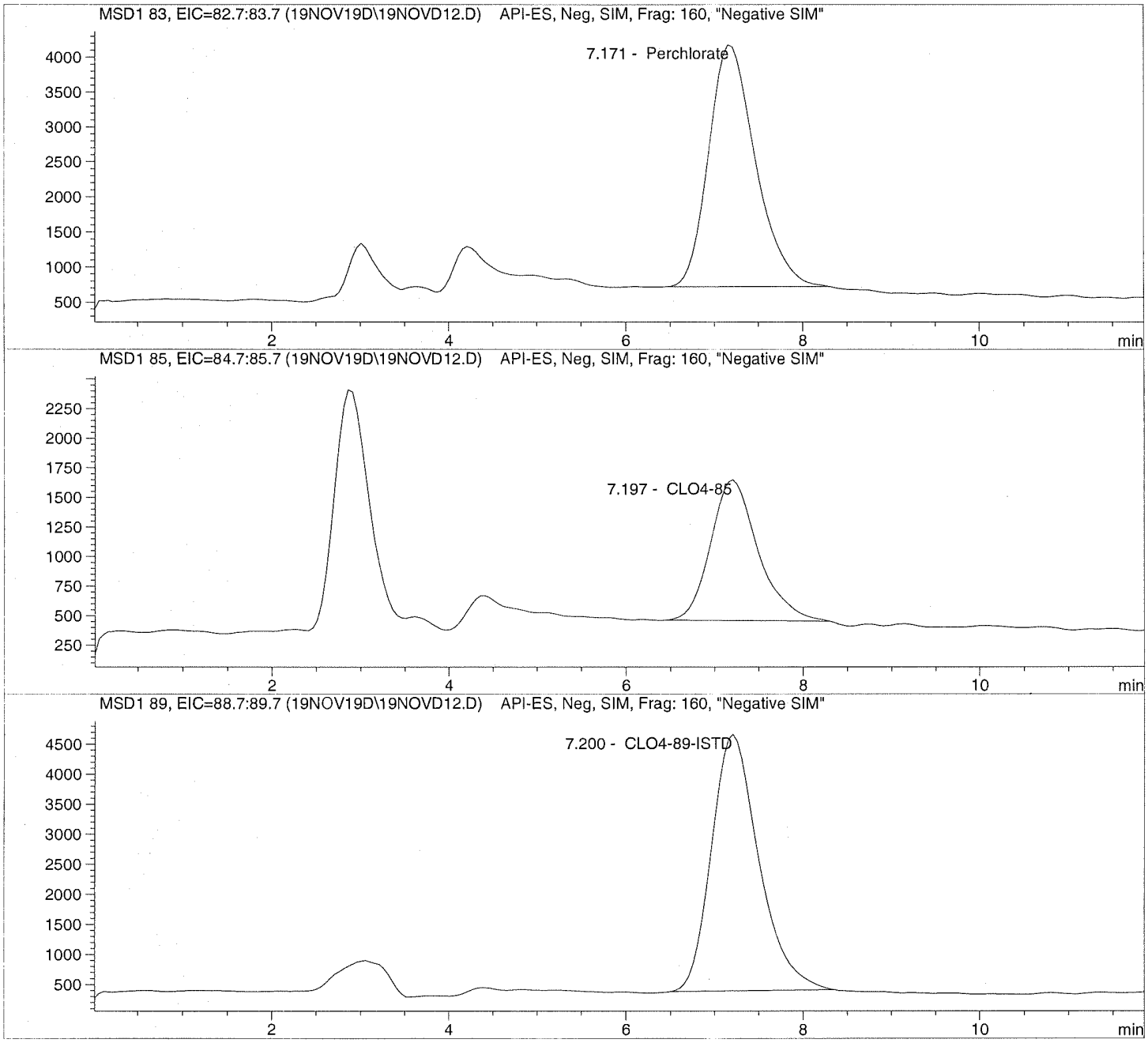
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD12.D Sample Name: 1931753008 MSD

Injection Date:	11/19/2019 11:22:36	Seq Line:	12
Sample Name:	1931753008 MSD	Location:	Vial 82
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD12.D Sample Name: 1931753008 MSD

Injection Date:	11/19/2019 11:22:36	Seq Line:	12
Sample Name:	1931753008 MSD	Location:	Vial 82
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.171	BBA	127059.9	2.9424	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.197	PBA	44389.7	3.2845	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.200	BBA	158843.2	5.0000	CLO4-89-ISTD

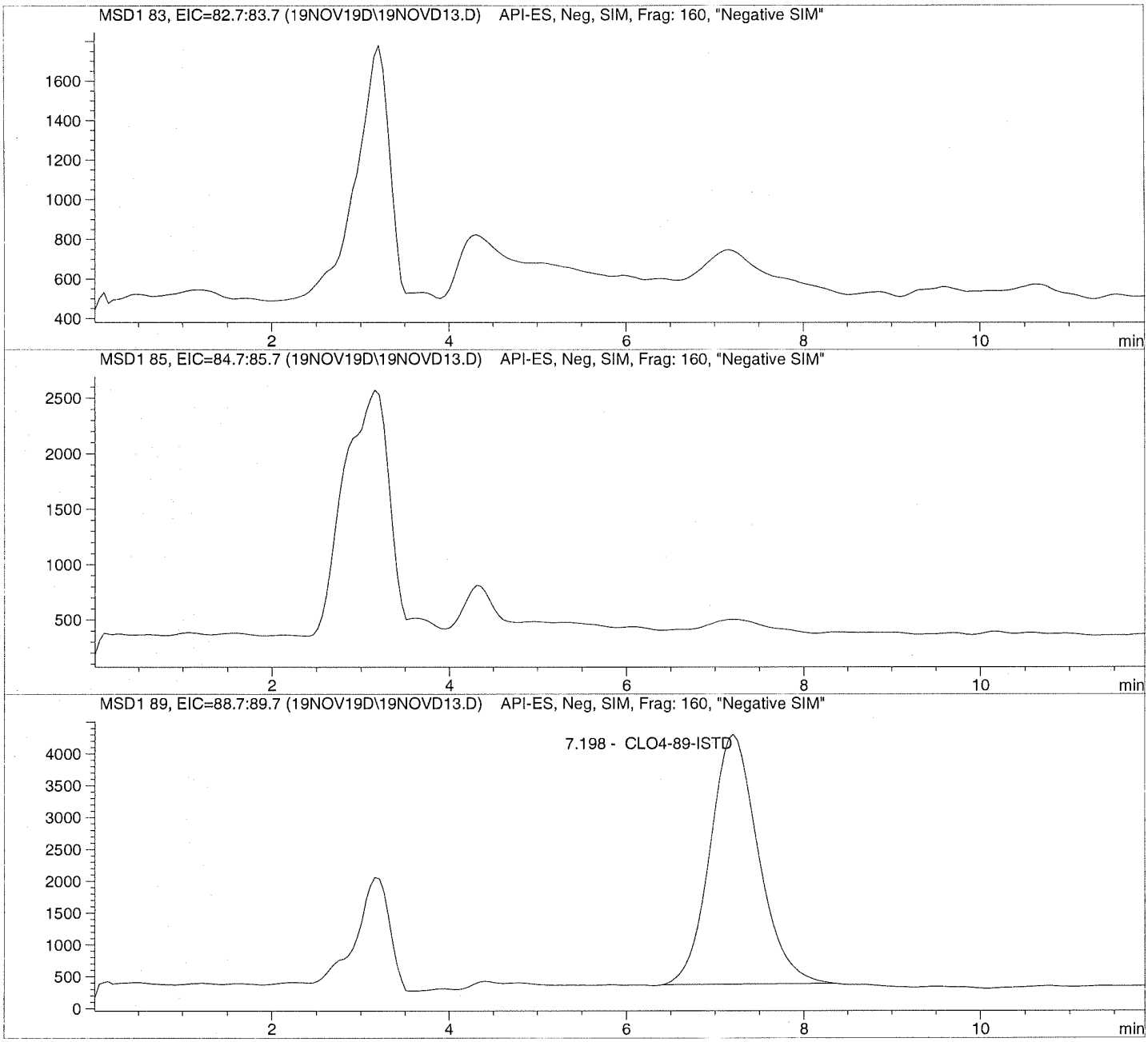
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD13.D Sample Name: 1931753009

Injection Date:	11/19/2019 11:36:21	Seq Line:	13
Sample Name:	1931753009	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD13.D Sample Name: 1931753009

Injection Date:	11/19/2019 11:36:21	Seq Line:	13
Sample Name:	1931753009	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.198	PBA	148964.8	5.0000	CLO4-89-ISTD

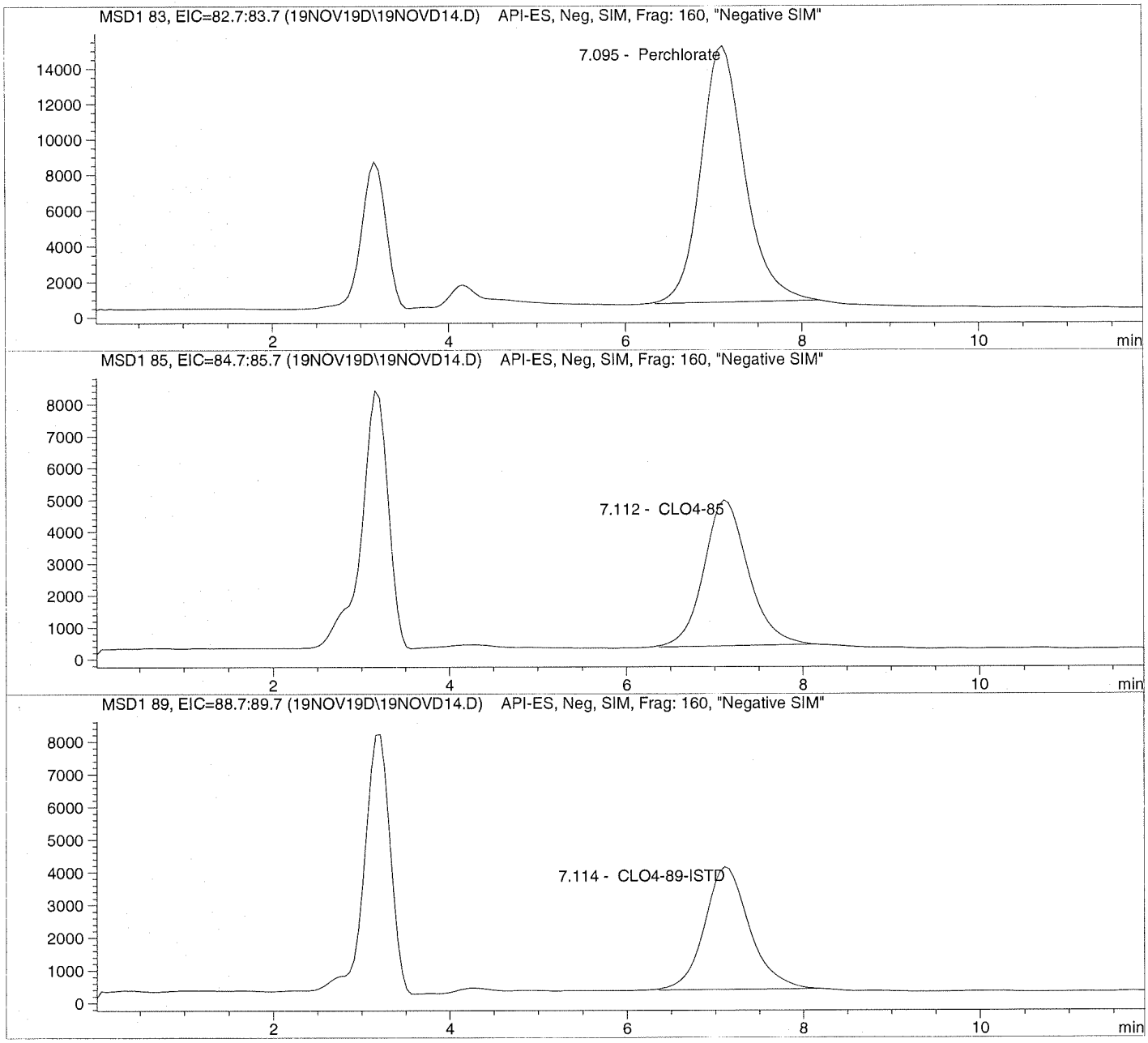
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD14.D Sample Name: 1931753010

Injection Date:	11/19/2019 11:50:06	Seq Line:	14
Sample Name:	1931753010	Location:	Vial 84
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD14.D Sample Name: 1931753010

Injection Date:	11/19/2019 11:50:06	Seq Line:	14
Sample Name:	1931753010	Location:	Vial 84
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.095	BBA	491725.6	13.3622	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.112	BBA	159613.7	14.1032	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.114	BBA	131911.3	5.0000	CLO4-89-ISTD

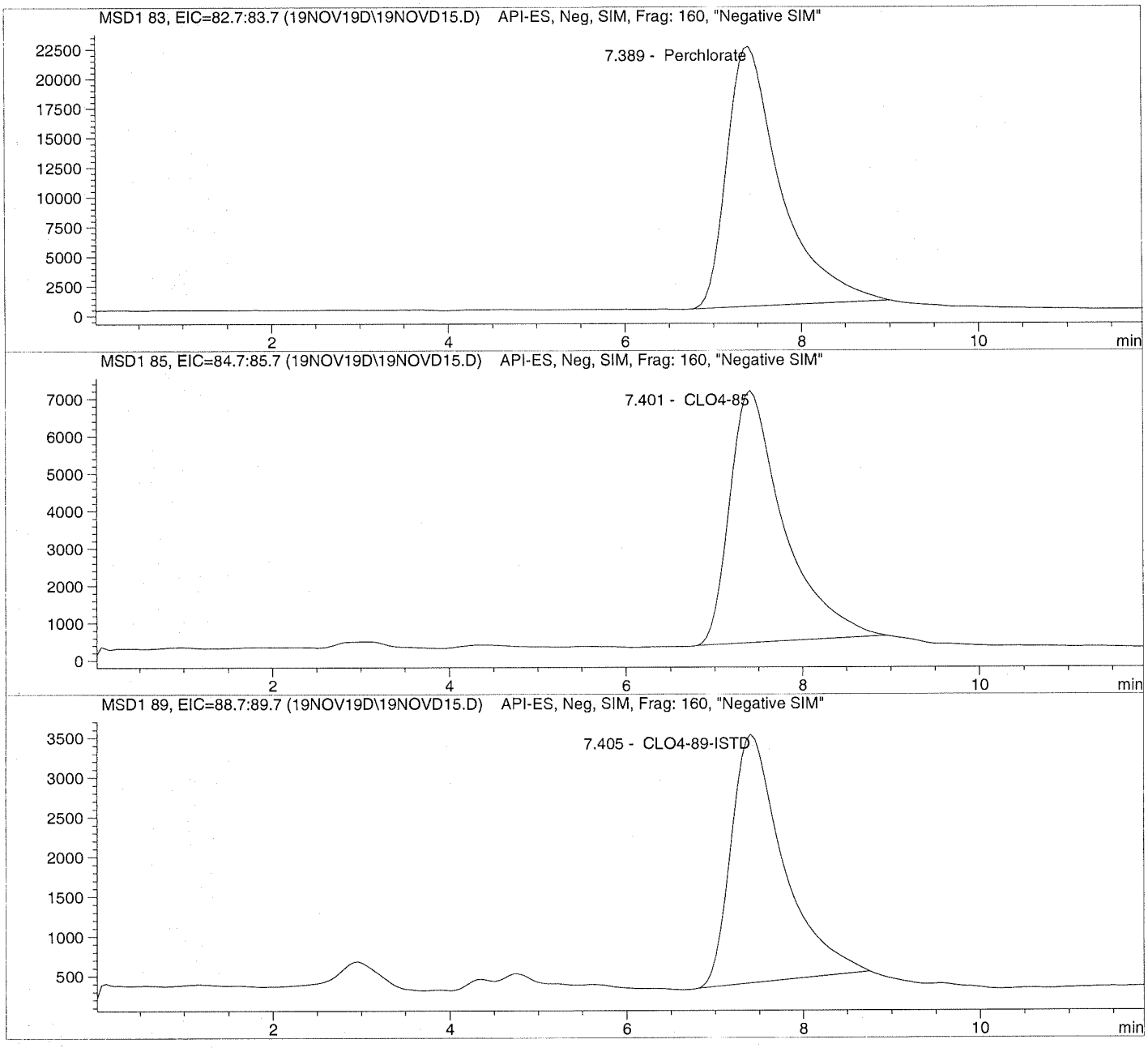
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD15.D Sample Name: 684809 CCV@25

Injection Date:	11/19/2019 12:03:53	Seq Line:	15
Sample Name:	684809 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD15.D Sample Name: 684809 CCV@25

Injection Date:	11/19/2019 12:03:53	Seq Line:	15
Sample Name:	684809 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.389	PBA	931288.6	24.6735	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.401	PBA	287273.8	24.9322	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.405	PBA	129143.4	5.0000	CLO4-89-ISTD

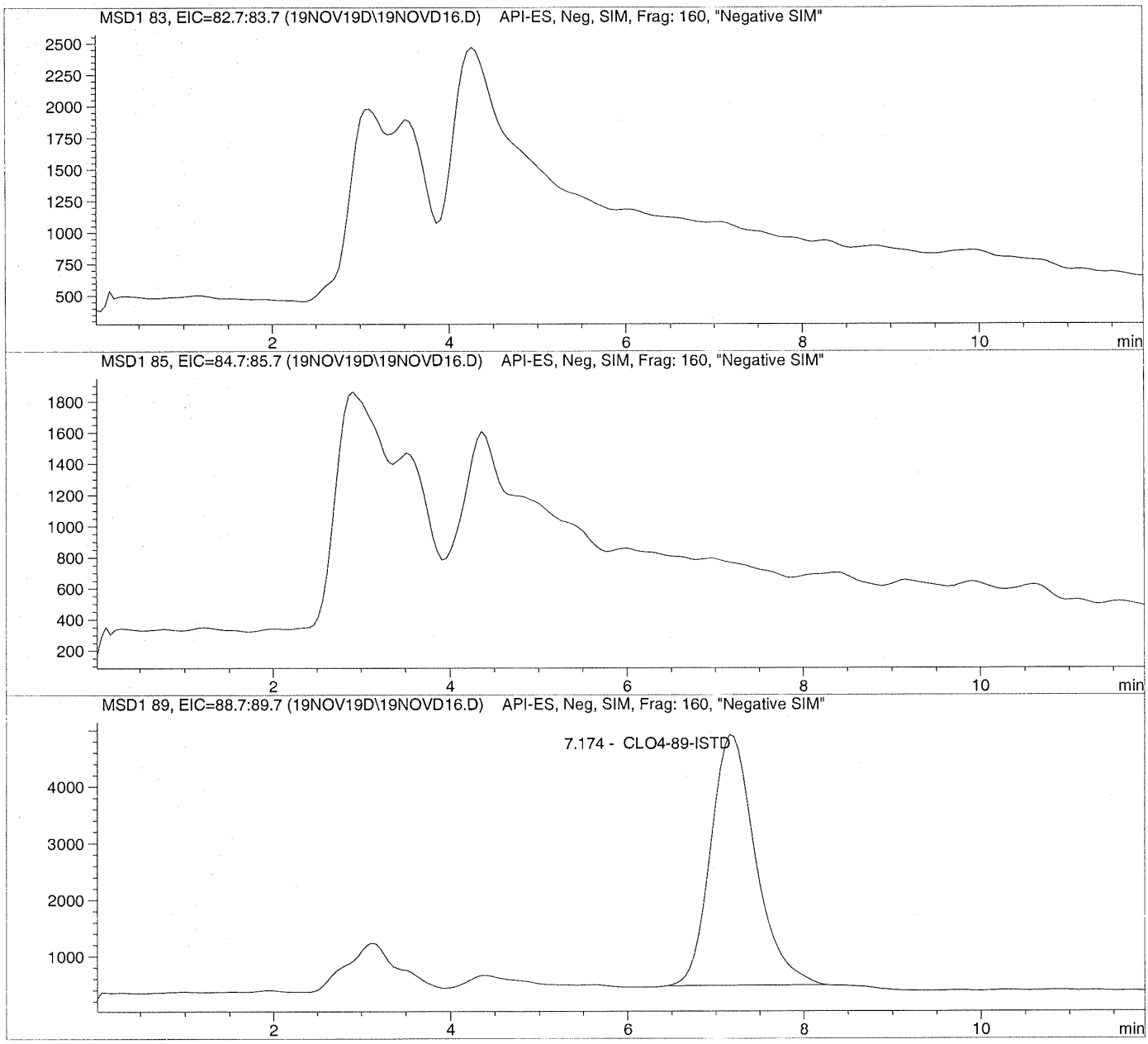
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD16.D Sample Name: 1931753011

Injection Date:	11/19/2019 12:17:41	Seq Line:	16
Sample Name:	1931753011	Location:	Vial 85
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD16.D Sample Name: 1931753011

Injection Date:	11/19/2019 12:17:41	Seq Line:	16
Sample Name:	1931753011	Location:	Vial 85
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.174	BBA	157072.7	5.0000	CLO4-89-ISTD

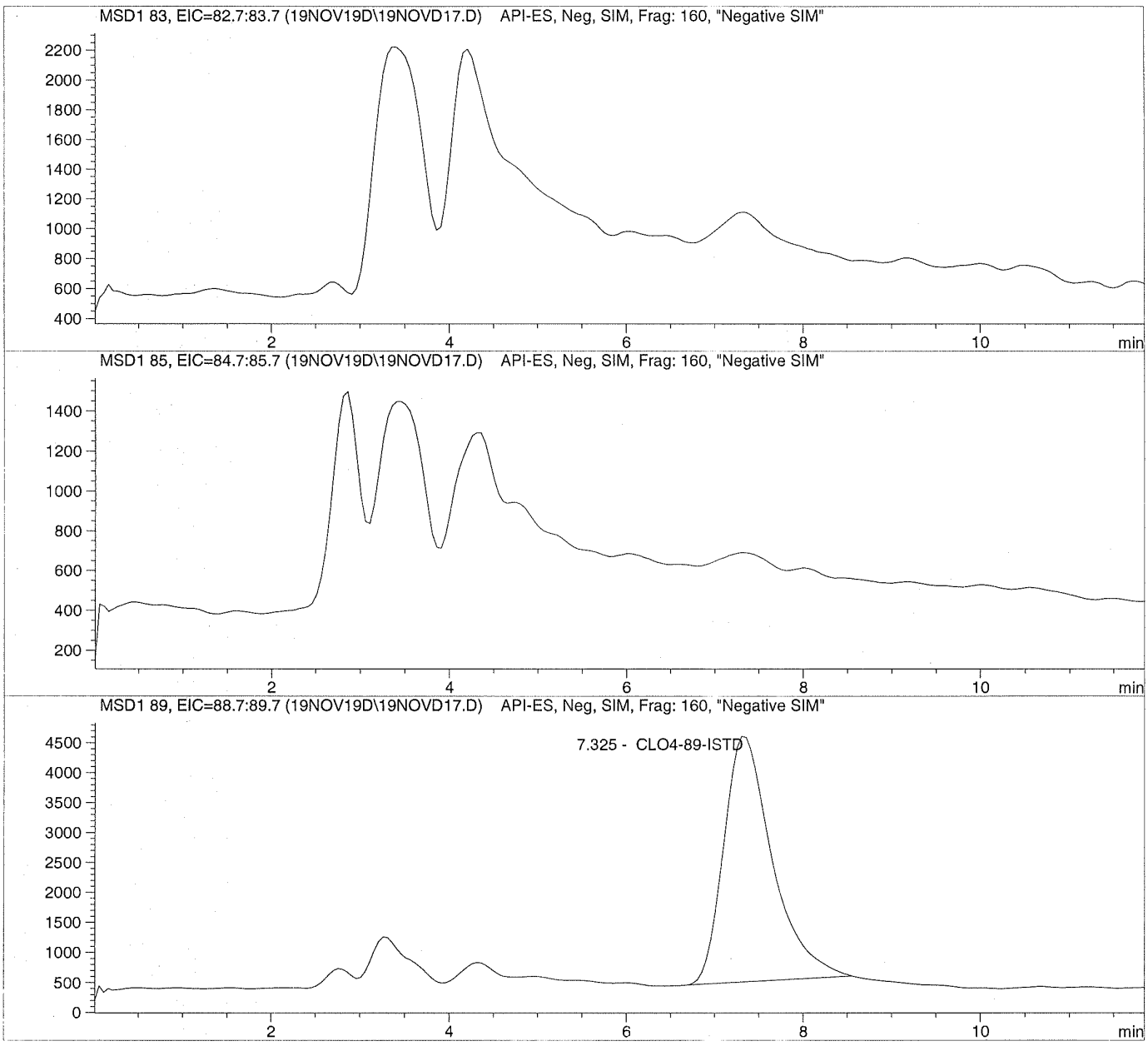
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD17.D Sample Name: 1931753012

Injection Date:	11/19/2019 12:31:25	Seq Line:	17
Sample Name:	1931753012	Location:	Vial 86
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD17.D Sample Name: 1931753012

Injection Date:	11/19/2019 12:31:25	Seq Line:	17
Sample Name:	1931753012	Location:	Vial 86
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.325	PBA	156727.4	5.0000	CLO4-89-ISTD

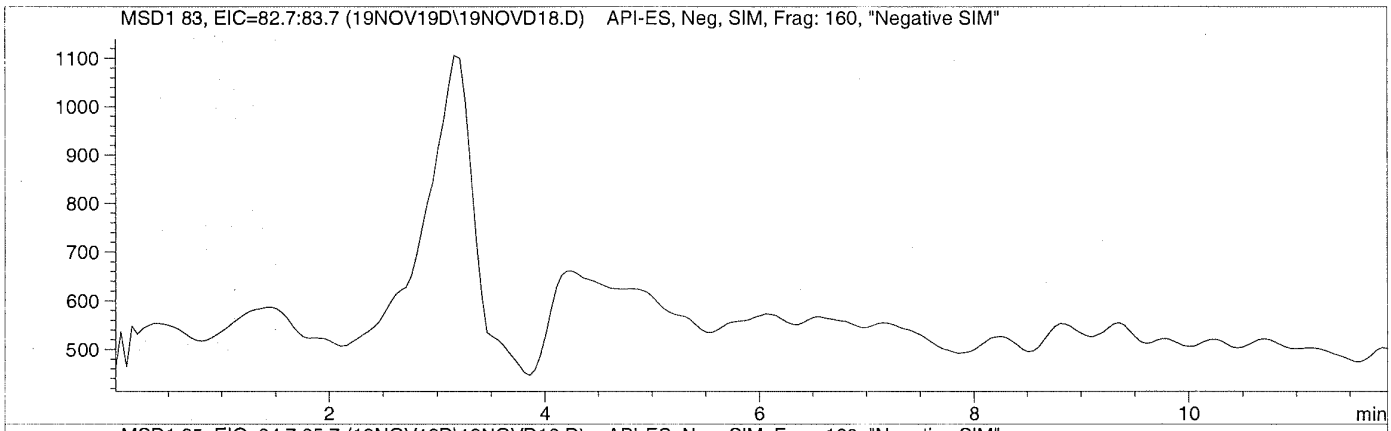
*** End of Report ***

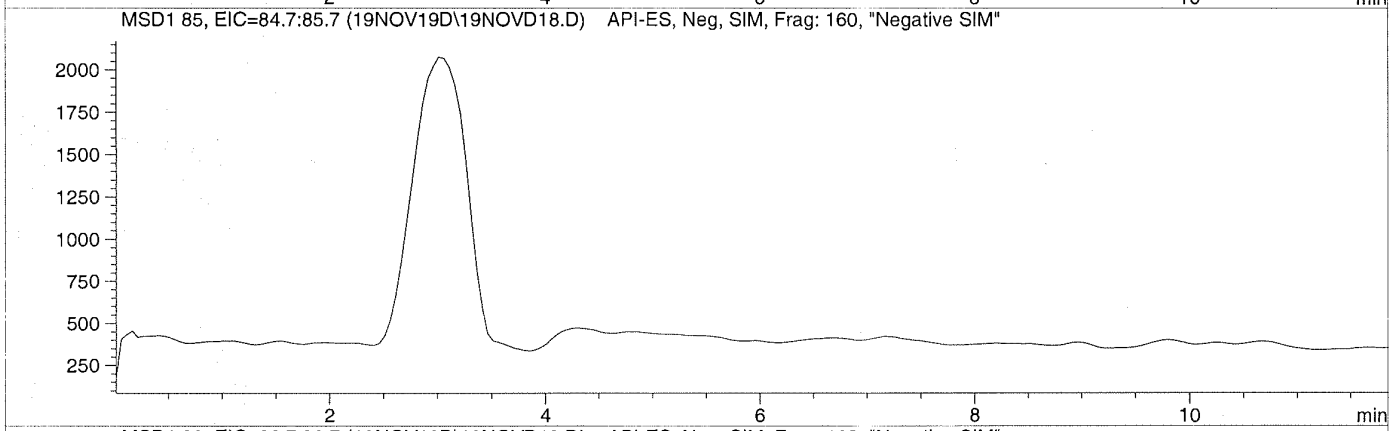
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD18.D Sample Name: 1931753013

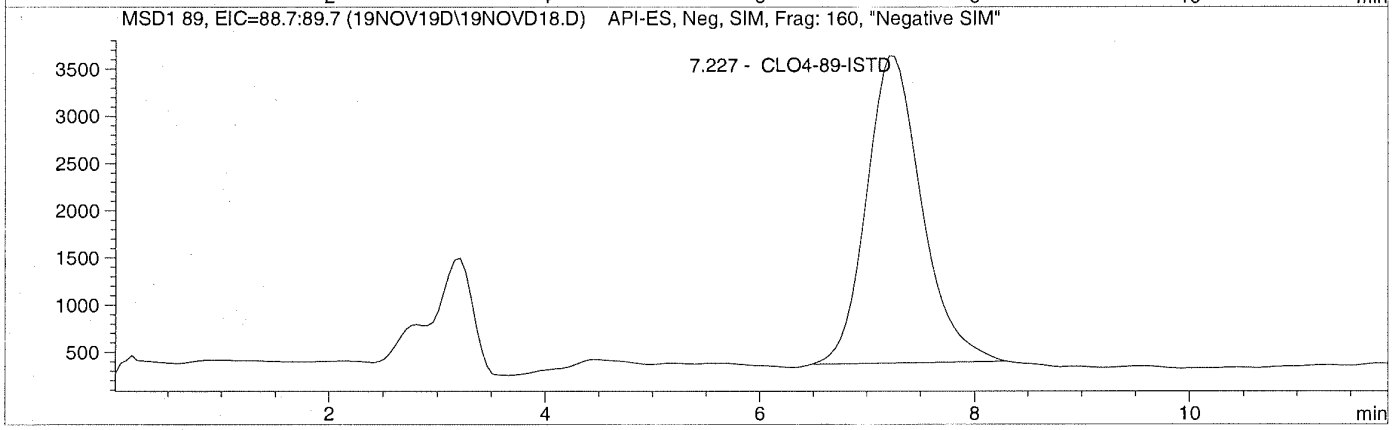
Injection Date:	11/19/2019 12:45:09	Seq Line:	18
Sample Name:	1931753013	Location:	Vial 87
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD18.D Sample Name: 1931753013

Injection Date:	11/19/2019 12:45:09	Seq Line:	18
Sample Name:	1931753013	Location:	Vial 87
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.227	BBA	116311.5	5.0000	CLO4-89-ISTD

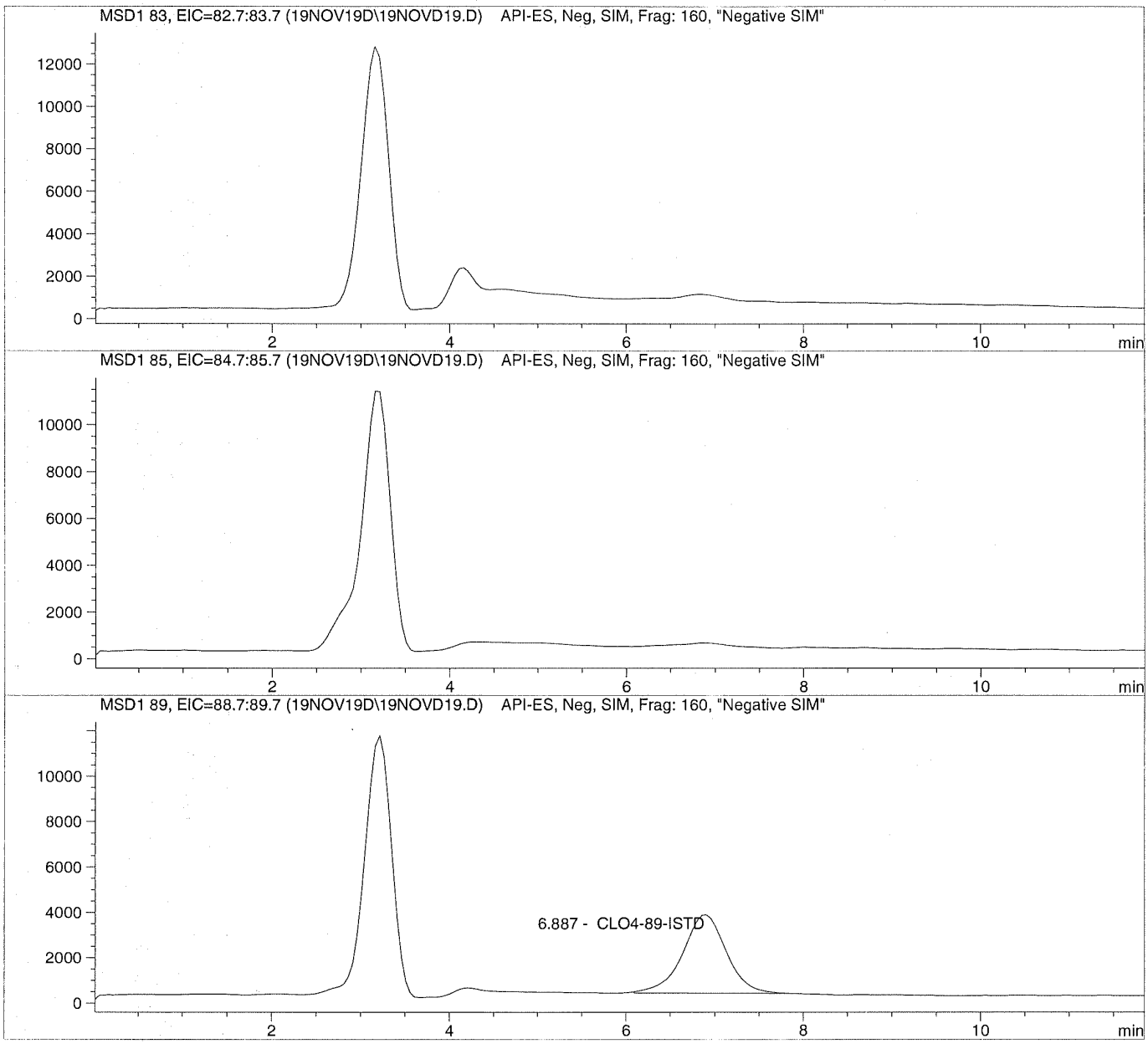
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD19.D Sample Name: 1932010001

Injection Date:	11/19/2019 12:58:54	Seq Line:	19
Sample Name:	1932010001	Location:	Vial 88
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD19.D Sample Name: 1932010001

Injection Date:	11/19/2019 12:58:54	Seq Line:	19
Sample Name:	1932010001	Location:	Vial 88
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.887	BBA	118043.7	5.0000	CLO4-89-ISTD

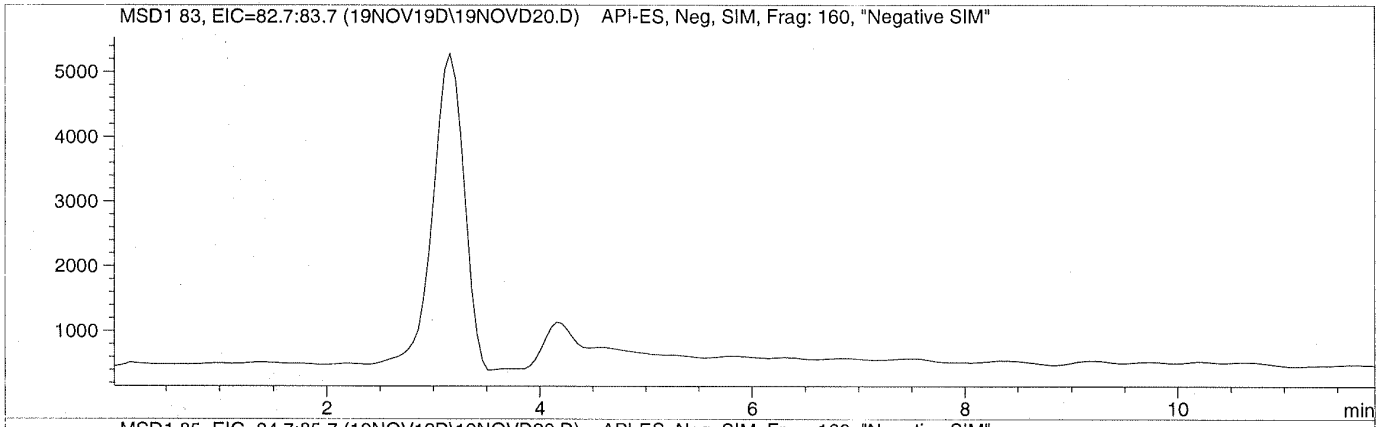
*** End of Report ***

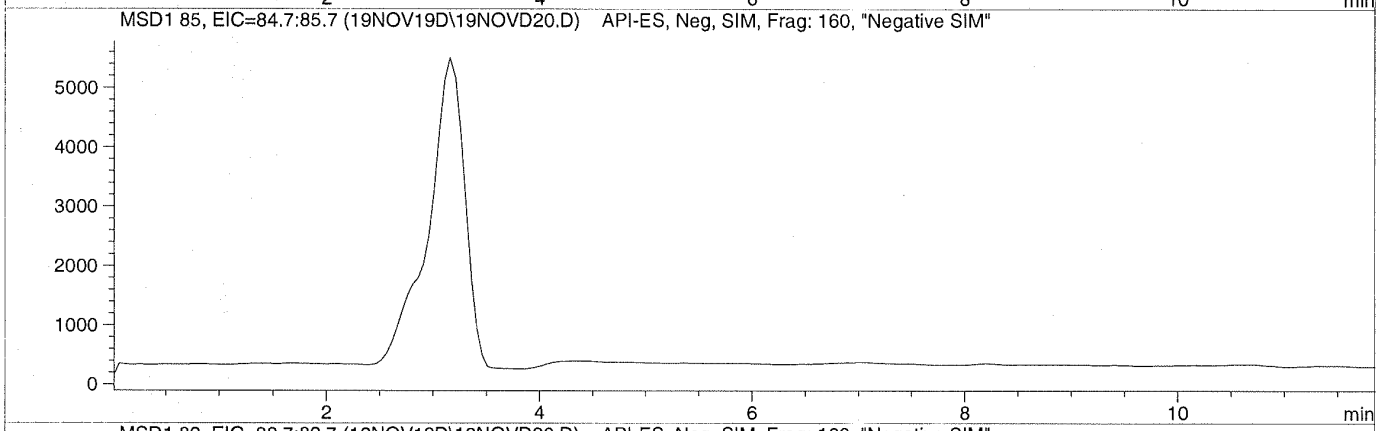
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD20.D Sample Name: 1932010002

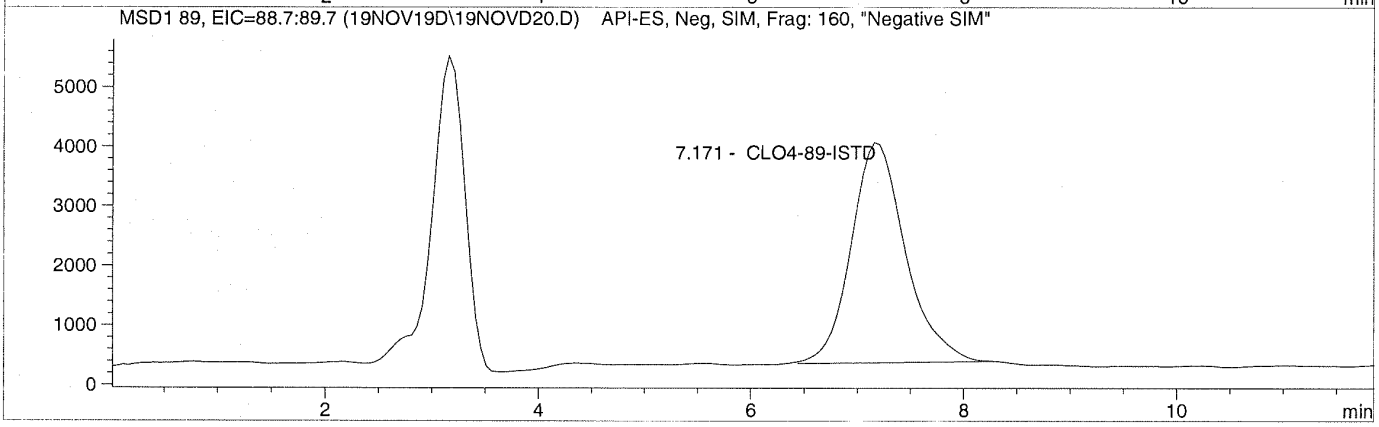
Injection Date:	11/19/2019 13:12:42	Seq Line:	20
Sample Name:	1932010002	Location:	Vial 89
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD20.D Sample Name: 1932010002

Injection Date:	11/19/2019 13:12:42	Seq Line:	20
Sample Name:	1932010002	Location:	Vial 89
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.171	BBA	130569.2	5.0000	CLO4-89-ISTD

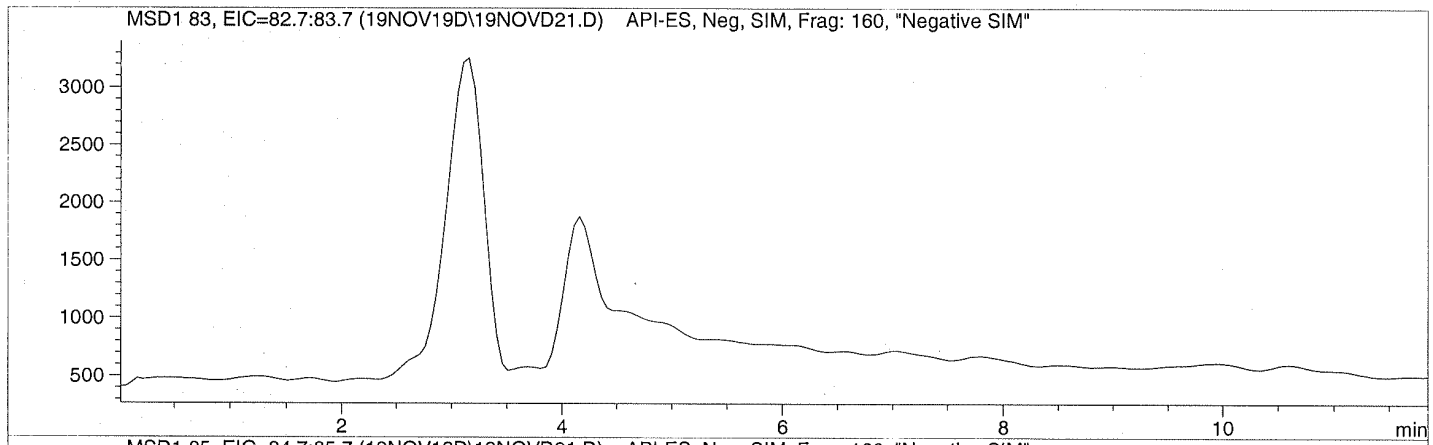
*** End of Report ***

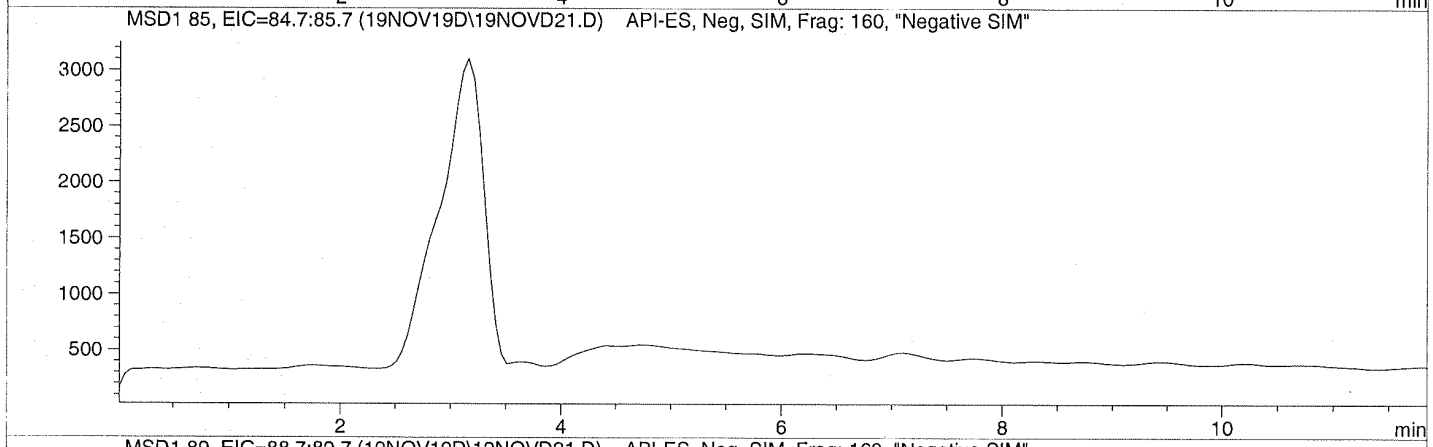
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD21.D Sample Name: 1932010003

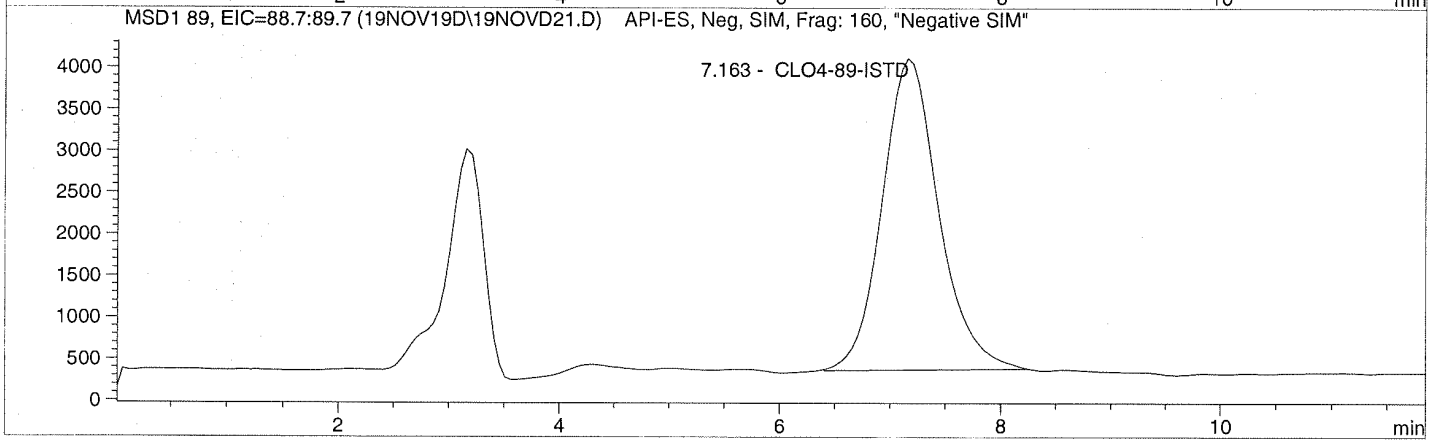
Injection Date:	11/19/2019 13:26:30	Seq Line:	21
Sample Name:	1932010003	Location:	Vial 90
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD21.D Sample Name: 1932010003

Injection Date:	11/19/2019 13:26:30	Seq Line:	21
Sample Name:	1932010003	Location:	Vial 90
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.163	PBA	133641.2	5.0000	CLO4-89-ISTD

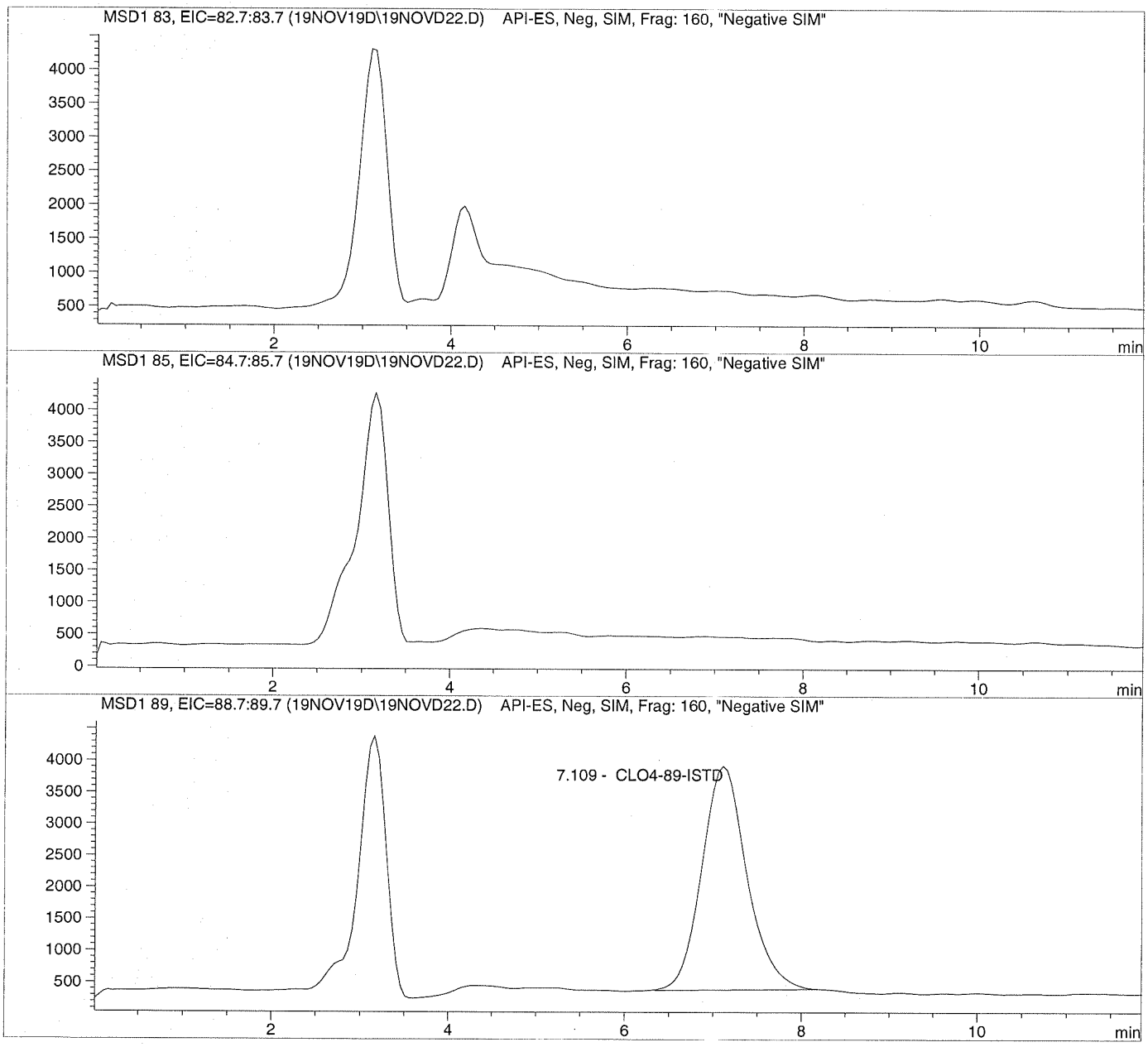
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD22.D Sample Name: 1932010004

Injection Date:	11/19/2019 13:40:18	Seq Line:	22
Sample Name:	1932010004	Location:	Vial 91
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD22.D Sample Name: 1932010004

Injection Date:	11/19/2019 13:40:18	Seq Line:	22
Sample Name:	1932010004	Location:	Vial 91
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.109	BBA	124695.0	5.0000	CLO4-89-ISTD

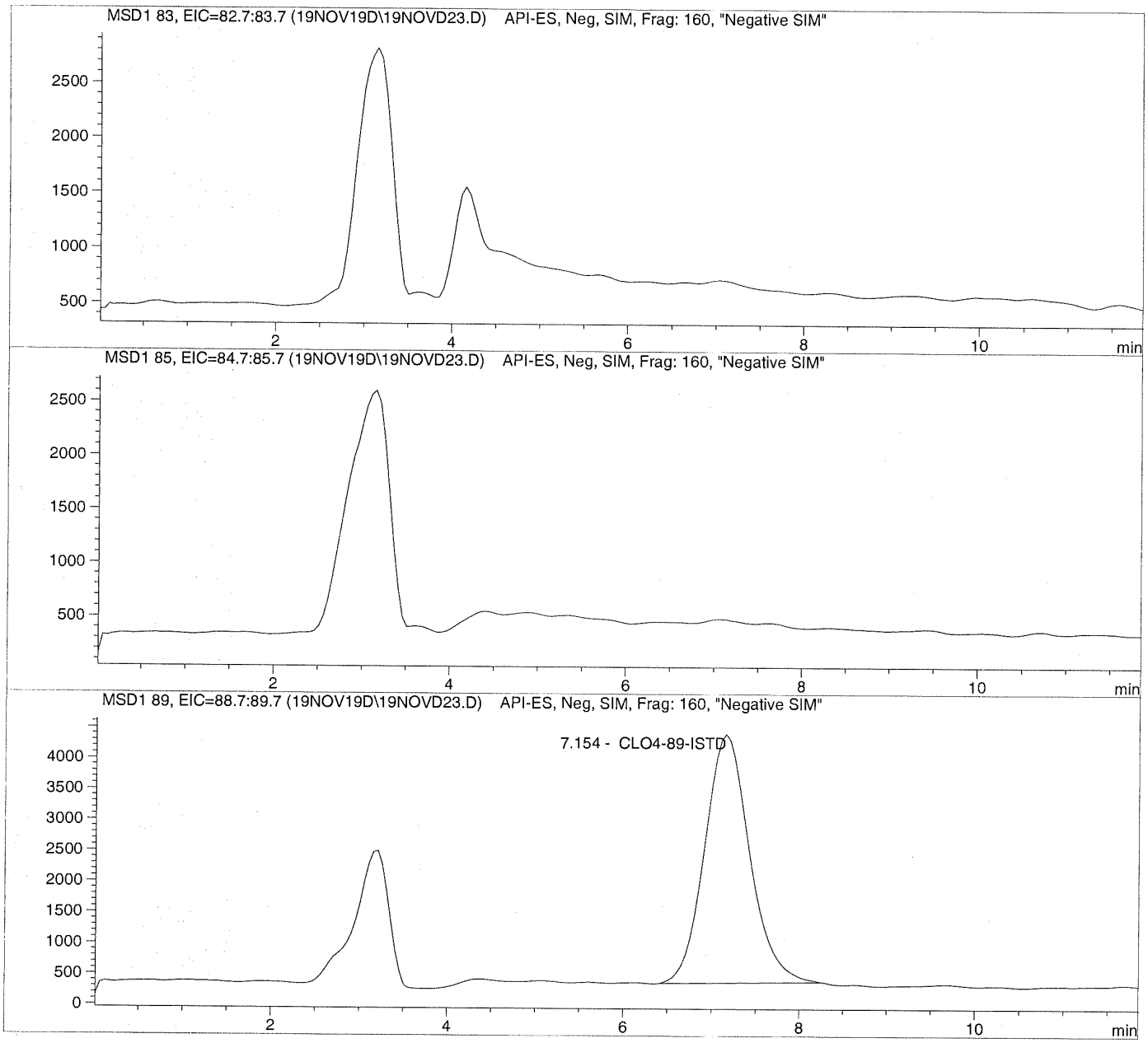
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD23.D Sample Name: 1932010005

Injection Date:	11/19/2019 13:54:05	Seq Line:	23
Sample Name:	1932010005	Location:	Vial 92
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD23.D Sample Name: 1932010005

Injection Date:	11/19/2019 13:54:05	Seq Line:	23
Sample Name:	1932010005	Location:	Vial 92
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.154	PBA	143110.0	5.0000	CLO4-89-ISTD

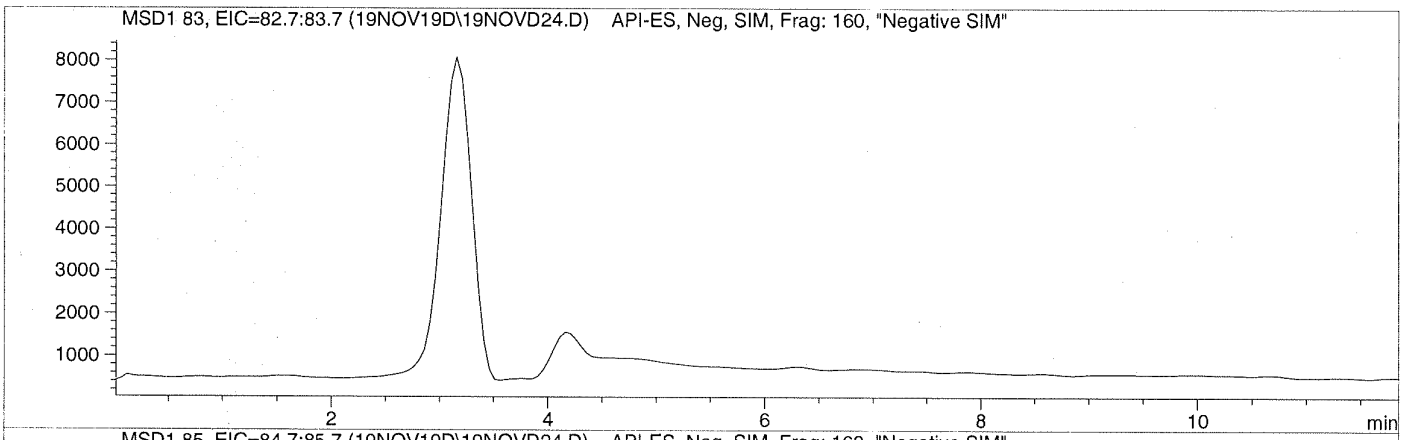
*** End of Report ***

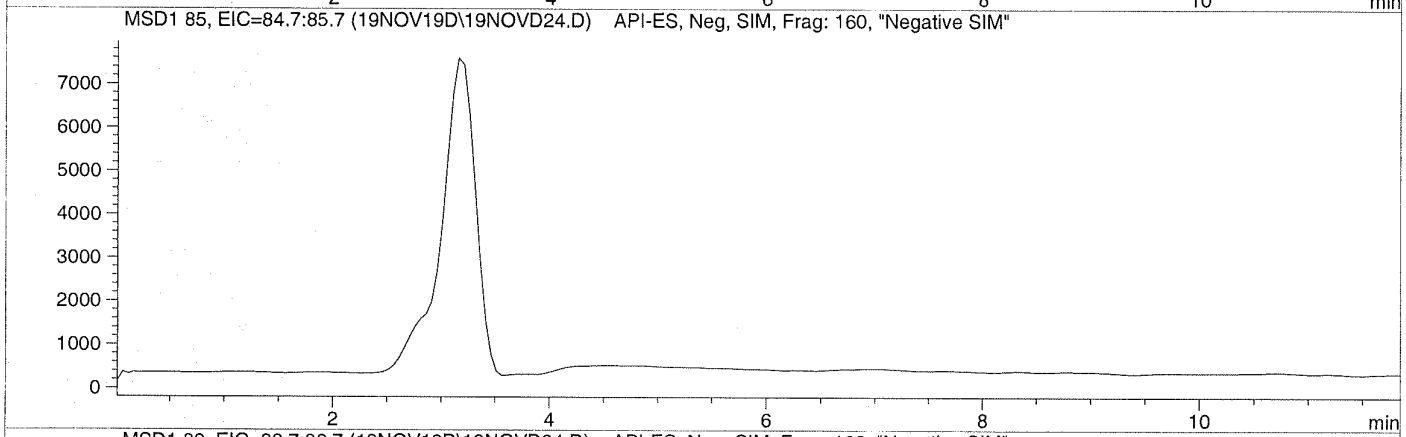
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD24.D Sample Name: 1932010006

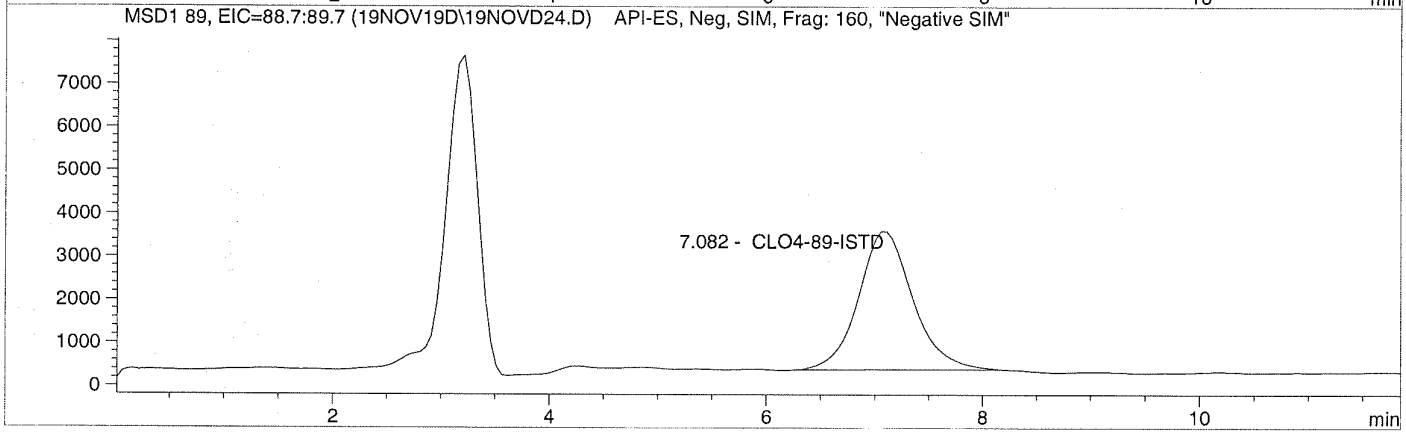
Injection Date:	11/19/2019 14:07:50	Seq Line:	24
Sample Name:	1932010006	Location:	Vial 93
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD24.D Sample Name: 1932010006

Injection Date:	11/19/2019 14:07:50	Seq Line:	24
Sample Name:	1932010006	Location:	Vial 93
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.082	BBA	112592.4	5.0000	CLO4-89-ISTD

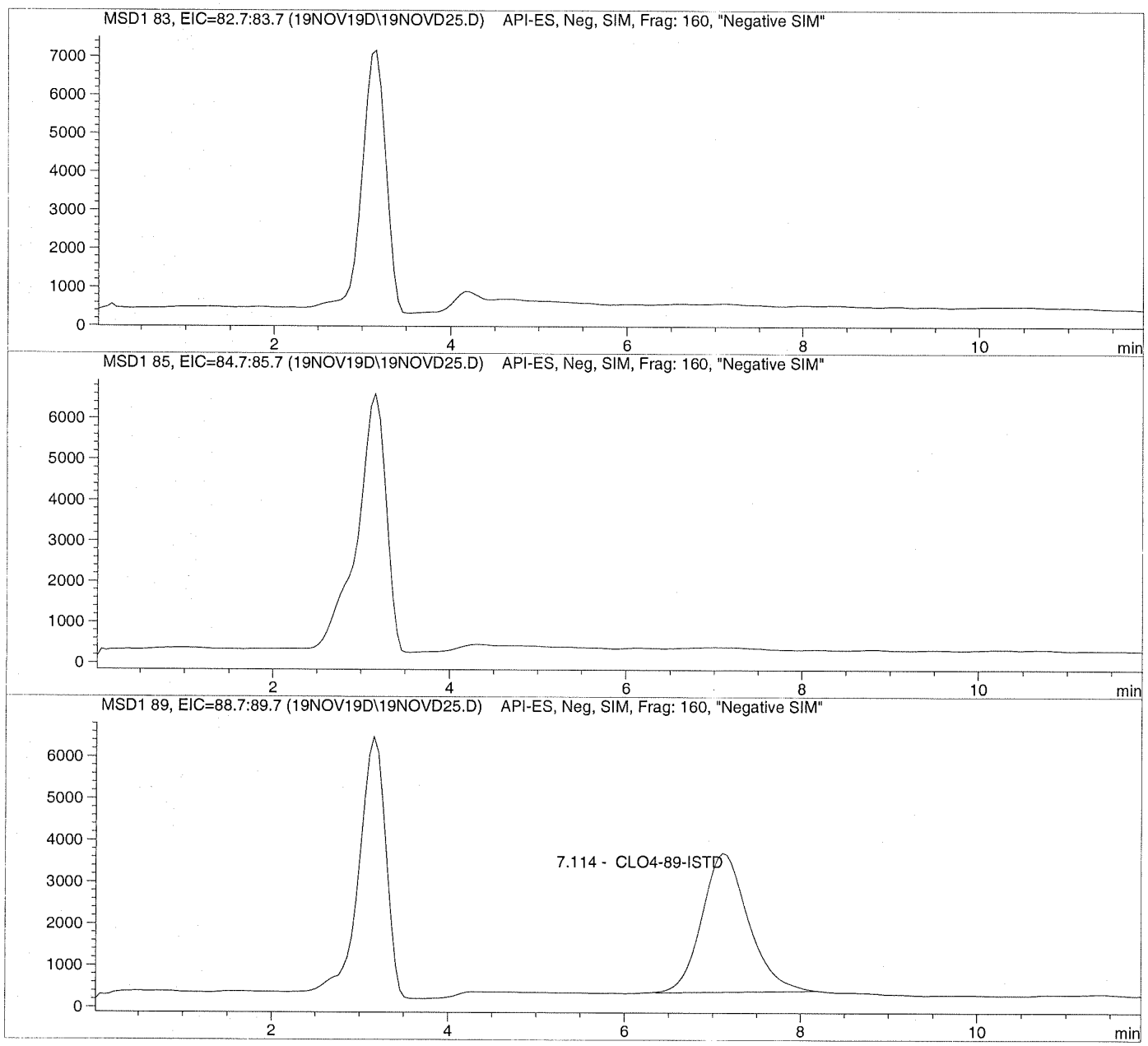
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD25.D Sample Name: 1932010007

Injection Date:	11/19/2019 14:21:39	Seq Line:	25
Sample Name:	1932010007	Location:	Vial 94
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD25.D Sample Name: 1932010007

Injection Date:	11/19/2019 14:21:39	Seq Line:	25
Sample Name:	1932010007	Location:	Vial 94
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.114	BBA	122347.6	5.0000	CLO4-89-ISTD

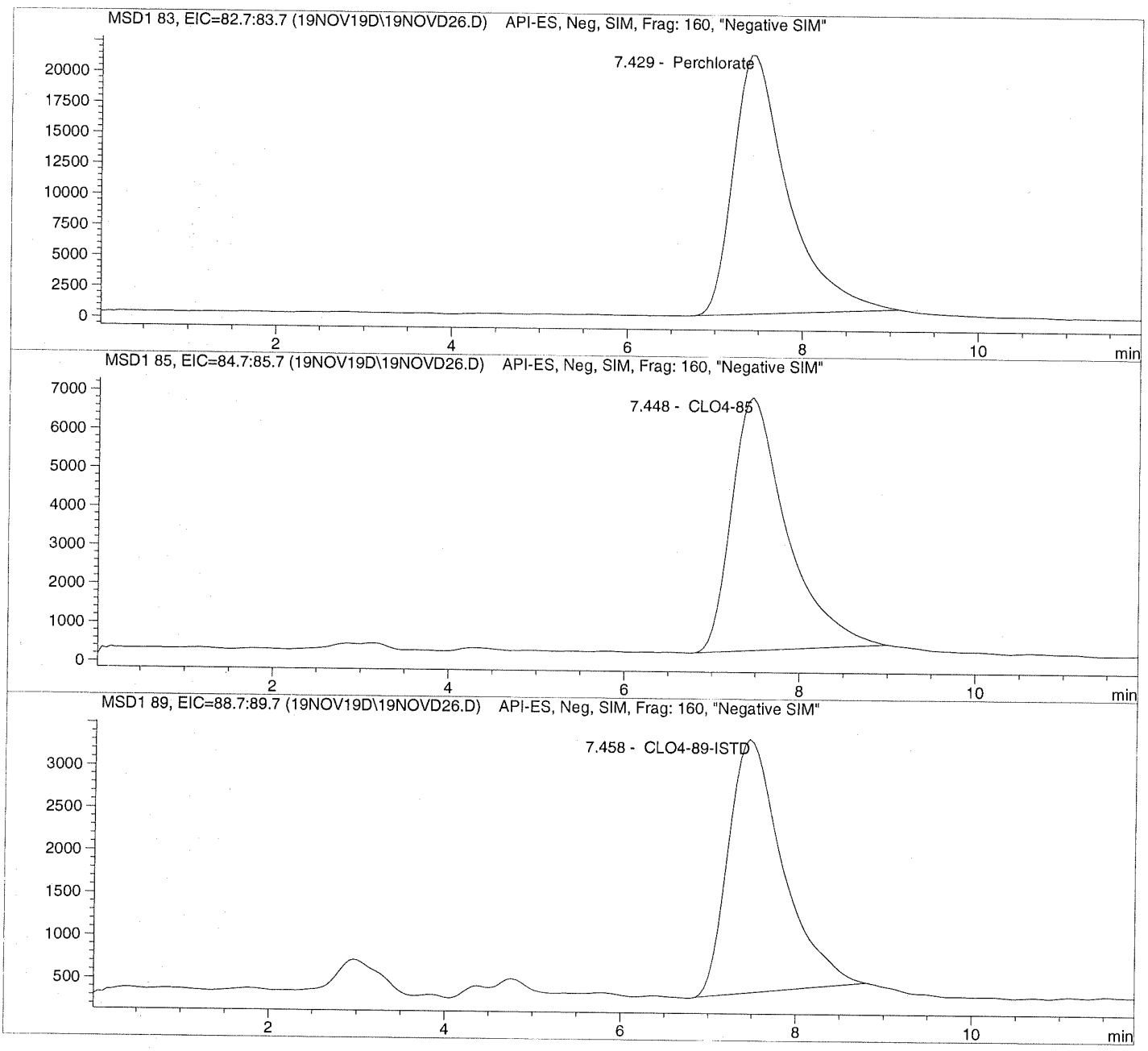
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD26.D Sample Name: 684810 CCV@25

Injection Date:	11/19/2019 14:35:25	Seq Line:	26
Sample Name:	684810 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD26.D Sample Name: 684810 CCV@25

Injection Date:	11/19/2019 14:35:25	Seq Line:	26
Sample Name:	684810 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.429	PBA	908551.0	24.2316	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.448	PBA	285244.9	24.8806	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.458	PBA	128522.3	5.0000	CLO4-89-ISTD

*** End of Report ***

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

Initial Calibration

==========
Calibration Table
==========

Perchlorate

Calib. Data Modified : 9/23/2019 12:20:59 PM

Calculate : Internal Standard
Based on : Peak Area

Rel. Reference Window : 20.000 %
Abs. Reference Window : 0.000 min
Rel. Non-ref. Window : 20.000 %
Abs. Non-ref. Window : 0.000 min
Use Multiplier & Dilution Factor with ISTDs
Uncalibrated Peaks : not reported
Partial Calibration : No recalibration if peaks missing

Curve Type : Quadratic (some peaks differ, see below)
Origin : Ignored (some peaks differ, see below)
Weight : Linear (Amnt) (some peaks differ, see below)

Recalibration Settings:
Average Response : Average all calibrations
Average Retention Time: Floating Average New 75%

Calibration Report Options :
Printout of recalibrations within a sequence:
Calibration Table after Recalibration
Normal Report after Recalibration
If the sequence is done with bracketing:
Results of first cycle (ending previous bracket)

Default Sample ISTD Information (if not set in sample table):

ISTD #	ISTD Amount	Name
1	5.00000	CLO4-89-ISTD

Signal 1: MSD1 83, EIC=82.7:83.7
Signal 2: MSD1 85, EIC=84.7:85.7
Signal 3: MSD1 89, EIC=88.7:89.7

RetTime [min]	Lvl	Sig	Amount	Area	Amt/Area	Ref	Grp	Name
7.750	1	3	1.00000	5.39218e4	1.85454e-5		1	Perchlorate
		4	2.00000	1.32825e5	1.50574e-5			
		5	5.00000	2.76271e5	1.80982e-5			
		6	10.00000	5.61298e5	1.78159e-5			
		7	25.00000	1.51820e6	1.64669e-5			
		8	50.00000	3.31156e6	1.50986e-5			
		9	75.00000	5.23914e6	1.43153e-5			
7.767	3	3	5.00000	2.14568e5	2.33026e-5	+I1		CLO4-89-ISTD
		4	5.00000	2.04758e5	2.44190e-5			
		5	5.00000	2.13407e5	2.34294e-5			
		6	5.00000	2.09246e5	2.38953e-5			
		7	5.00000	2.07403e5	2.41077e-5			
		8	5.00000	2.02929e5	2.46391e-5			
		9	5.00000	1.97933e5	2.52611e-5			
7.778	2	3	1.00000	1.70436e4	5.86732e-5		1	CLO4-85
		4	2.00000	4.20754e4	4.75337e-5			
		5	5.00000	9.24707e4	5.40712e-5			
		6	10.00000	1.68622e5	5.93041e-5			
		7	25.00000	4.63724e5	5.39114e-5			
		8	50.00000	9.95933e5	5.02042e-5			

Method C:\HPCHEM\1\METHODS\CLO4-DP3.M

RetTime [min]	Lvl	Amount	Area	Amt/Area	Ref	Grp	Name
	9	75.00000	1.58066e6	4.74484e-5			

More compound-specific settings:

Compound: Perchlorate
- Time Window : From 3.581 min To 11.899 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 0.5
  - Level 5 : 0.2
  - Level 6 : 0.1
  - Level 7 : 0.04
  - Level 8 : 0.02
  - Level 9 : 0.013333

Compound: CLO4-89-ISTD
- Time Window : From 3.581 min To 11.896 min
- Curve Type : Linear
- Origin : Included
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 1
  - Level 5 : 1
  - Level 6 : 1
  - Level 7 : 1
  - Level 8 : 1
  - Level 9 : 1

Compound: CLO4-85
- Time Window : From 3.601 min To 11.913 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 0.5
  - Level 5 : 0.2
  - Level 6 : 0.1
  - Level 7 : 0.04
  - Level 8 : 0.02
  - Level 9 : 0.013333

==========

Peak Sum Table

==========

No Entries in table

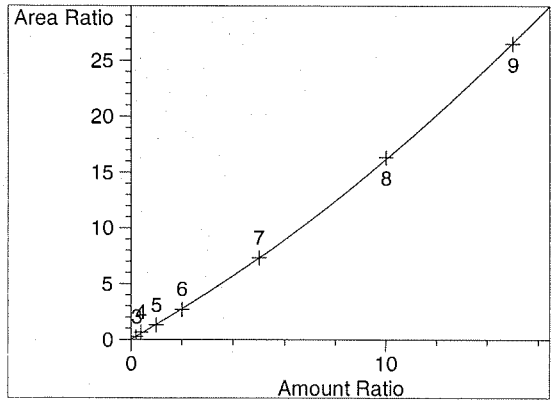
==========

Method C:\HPCHEM\1\METHODS\CLO4-DP3.M

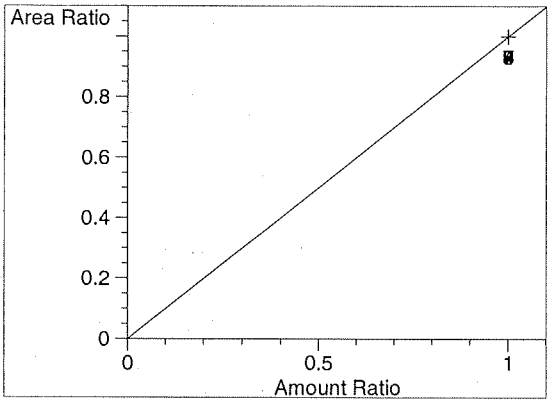
==========

Calibration Curves

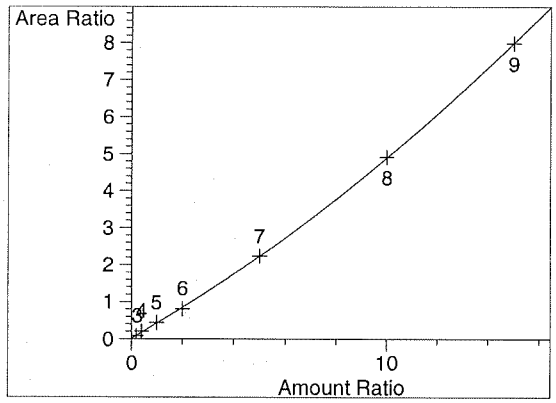
==========



Perchlorate at exp. RT: 7.750
MSD1 83, EIC=82.7:83.7
Correlation: 0.99975
Residual Std. Dev.: 0.10284
Formula: $y = ax^2 + bx + c$
a: 3.10463e-2
b: 1.30369
c: 2.19496e-2
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 0.5
Level 5 : 0.2
Level 6 : 0.1
Level 7 : 0.04
Level 8 : 0.02
Level 9 : 0.013333



CLO4-89-ISTD at exp. RT: 7.767
MSD1 89, EIC=88.7:89.7
Correlation: 1.00000
Residual Std. Dev.: 0.00000
Formula: $y = mx + b$
m: 1.00000
b: 0.00000
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 1
Level 5 : 1
Level 6 : 1
Level 7 : 1
Level 8 : 1
Level 9 : 1



CLO4-85 at exp. RT: 7.778
MSD1 85, EIC=84.7:85.7
Correlation: 0.99969
Residual Std. Dev.: 0.02601
Formula: $y = ax^2 + bx + c$
a: 8.85207e-3
b: 3.99283e-1
c: 1.33505e-2
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 0.5
Level 5 : 0.2
Level 6 : 0.1
Level 7 : 0.04
Level 8 : 0.02
Level 9 : 0.013333

==========

Batch Report: C:\HPCHEM\1\DATA\20SEP19I\20SEP19D.B

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP3.M

['#' ==> Run has not been reprocessed with Batch Review Method
'*' ==> Run has been saved with batch file]

#	Sample	Location	Inj	SampleType	Run	Perchlorate Area	Perchlorat RT	Perchlorate Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	5.39218e4	7.750	8.75982e-1
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	1.32825e5	7.797	2.37682
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	2.76271e5	7.770	4.77237
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	5.61298e5	7.785	9.75097
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	1.51820e6	7.741	25.01082
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	3.31156e6	7.775	50.40300
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	5.23914e6	7.736	74.79107
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	5.74879e5	7.756	10.11855

#	Sample	Location	Inj	SampleType	Run	CLO4-89-ISTD Area	CLO4-89-IS RT	CLO4-89-ISTD Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	2.14568e5	7.767	5.00000
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	2.04758e5	7.816	5.00000
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	2.13407e5	7.793	5.00000
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	2.09246e5	7.798	5.00000
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	2.07403e5	7.763	5.00000
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	2.02929e5	7.800	5.00000
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	1.97933e5	7.765	5.00000
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	2.06243e5	7.776	5.00000

#	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	1.70436e4	7.778	8.24488e-1
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	4.20754e4	7.805	2.38090
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	9.24707e4	7.787	5.14166
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	1.68622e5	7.781	9.52209
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	4.63724e5	7.760	25.04916
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	9.95933e5	7.793	50.14223
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	1.58066e6	7.758	74.93659
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	1.71000e5	7.760	9.79043

*** End of Report ***

Sequence: C:\HPCHEM\1\SEQUENCE\CLO4\2019\SEP\20SEP19I.S

Sequence Table:

Method and Injection Info Part:

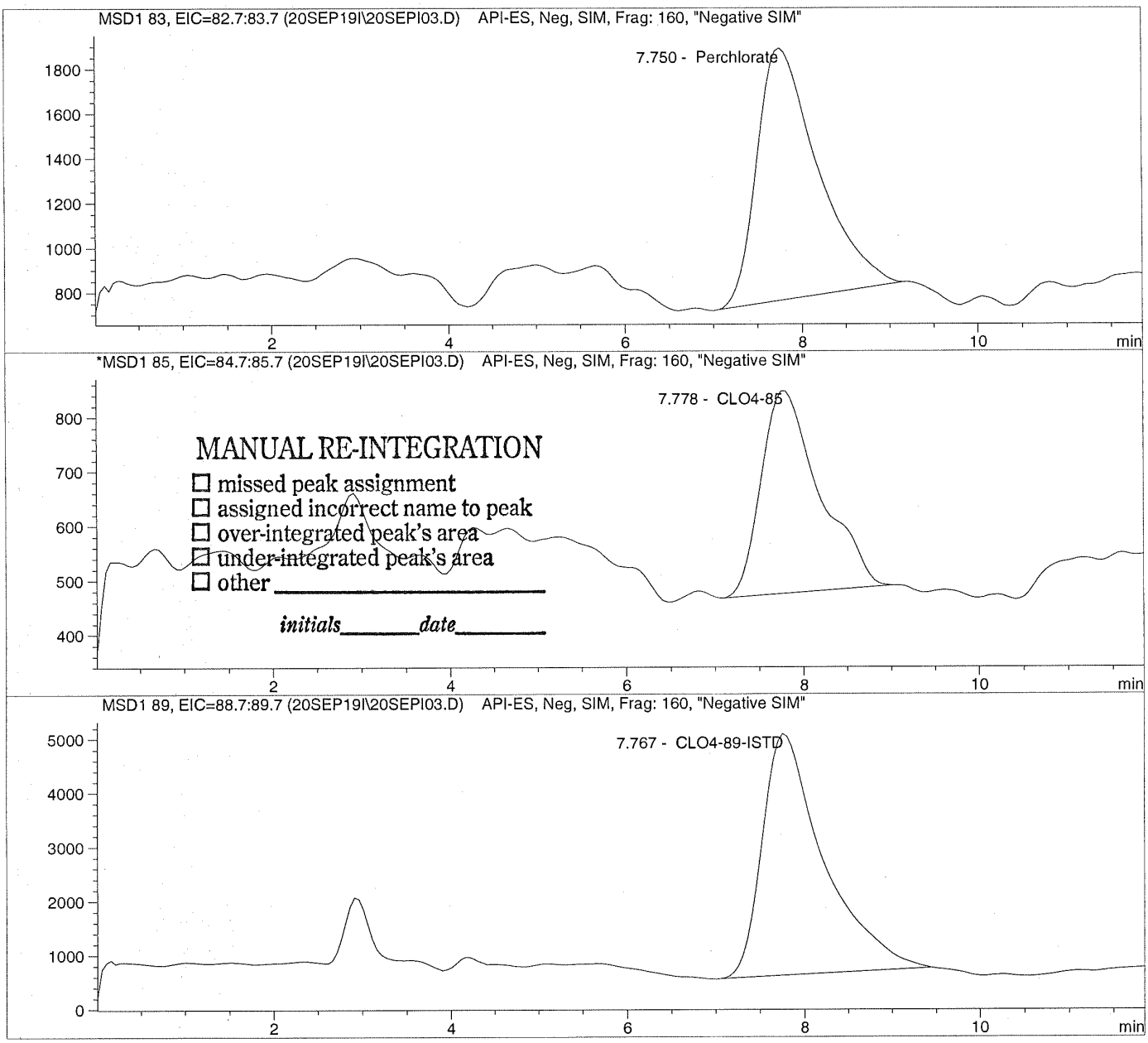
Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	CLO4@ 0.2ug/L	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	CLO4@ 0.5ug/L	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	CLO4@ 1.0ug/L	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	CLO4@ 2.0ug/L	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	CLO4@ 5.0ug/L	CLO4-AQN	1	Ctrl Samp		
6	Vial 76	CLO4@ 10.ug/L	CLO4-AQN	1	Ctrl Samp		
7	Vial 77	CLO4@ 25.ug/L	CLO4-AQN	1	Ctrl Samp		
8	Vial 78	CLO4@ 50.ug/L	CLO4-AQN	1	Ctrl Samp		
9	Vial 79	CLO4@ 75.ug/L	CLO4-AQN	1	Ctrl Samp		
10	Vial 71	CLO4@ 0.2ug/L	CLO4-AQN	1	Ctrl Samp		
11	Vial 80	ICAL Verf@10ug/L	CLO4-AQN	1	Ctrl Samp		

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	1.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.750	PBA	53921.8	0.8760	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.778	MM	17043.6	0.8245	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.767	PBA	214568.1	5.0000	CLO4-89-ISTD

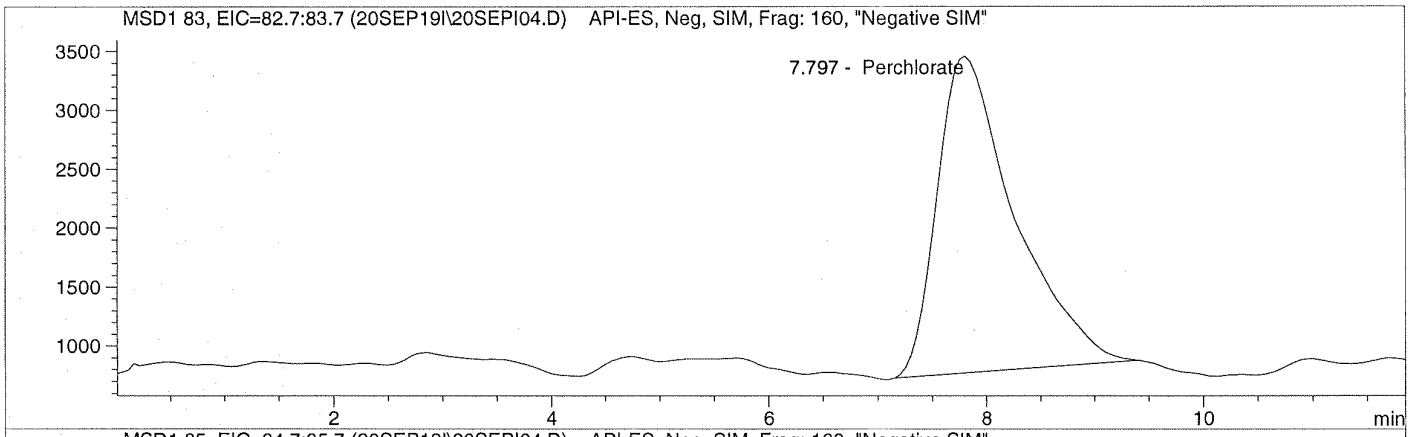
*** End of Report ***

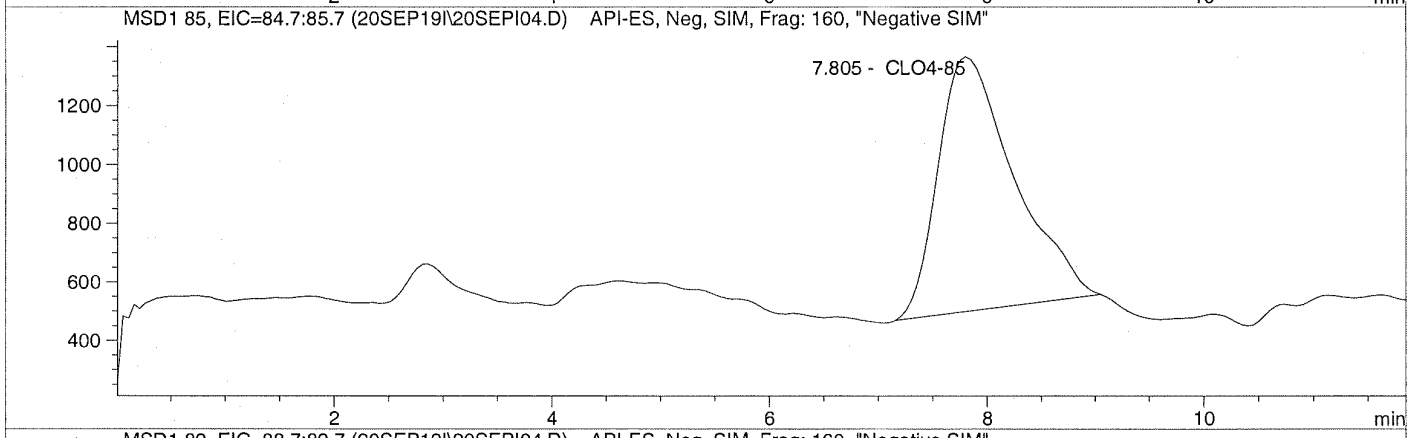
Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI04.D Sample Name: CLO4@ 2.0ug/L

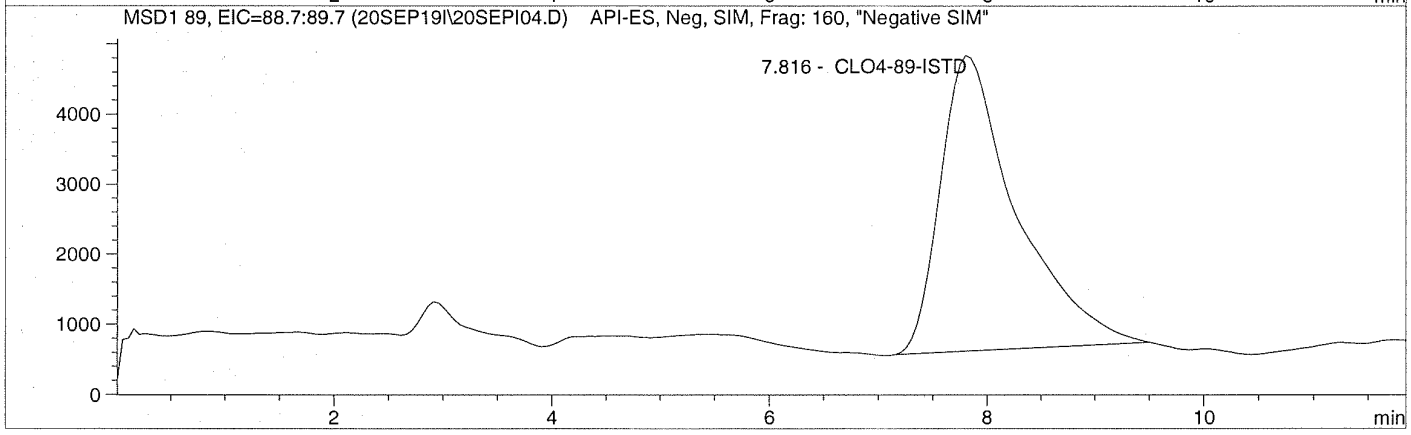
Injection Date:	9/20/2019 09:37:58	Seq Line:	4
Sample Name:	CLO4@ 2.0ug/L	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI04.D Sample Name: CLO4@ 2.0ug/L

Injection Date:	9/20/2019 09:37:58	Seq Line:	4
Sample Name:	CLO4@ 2.0ug/L	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	2.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.797	PBA	132825.2	2.3768	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.805	PBA	42075.4	2.3809	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.816	PBA	204758.3	5.0000	CLO4-89-ISTD

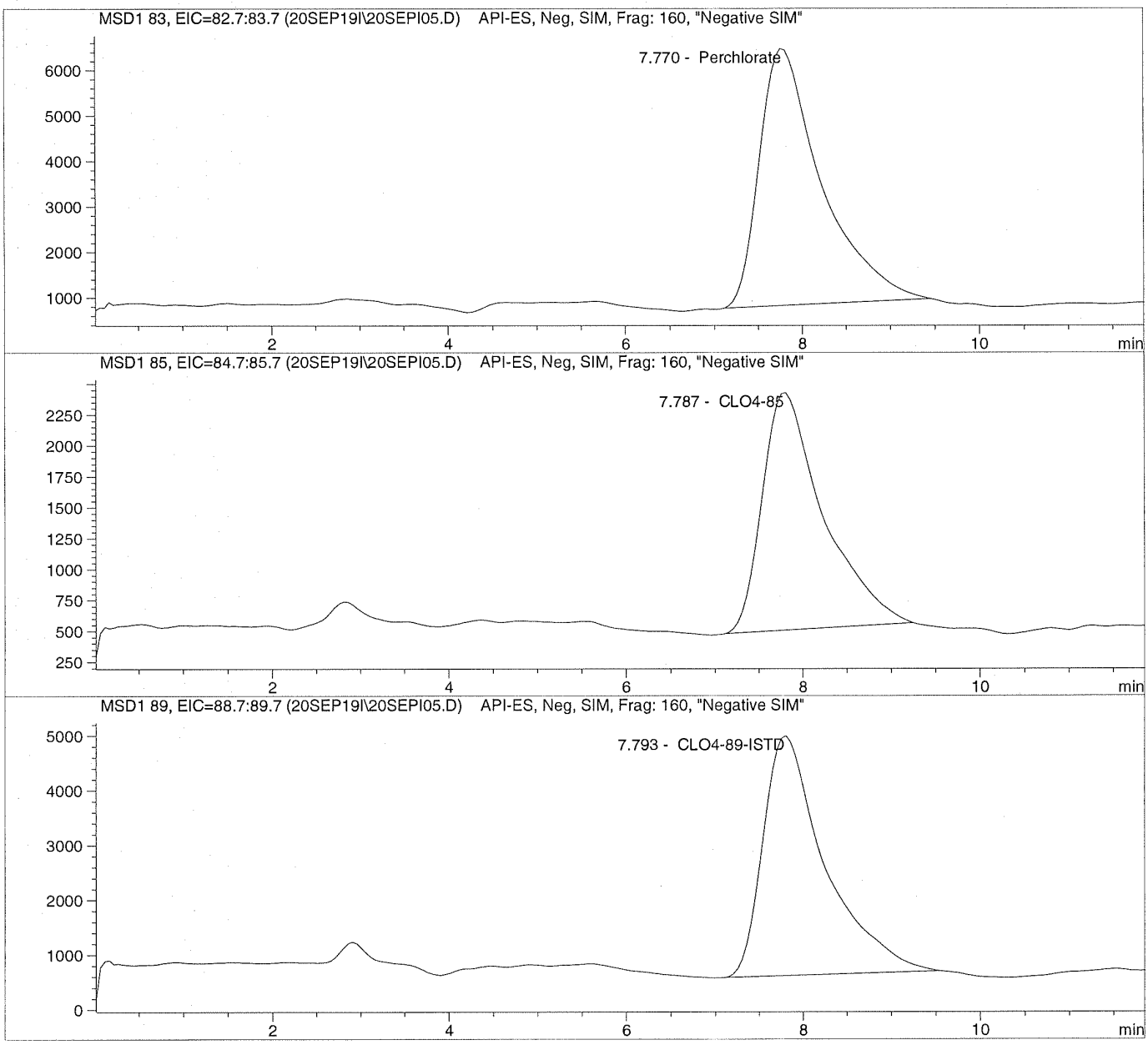
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	9/20/2019 09:51:49	Seq Line:	5
Sample Name:	CLO4@ 5.0ug/L	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	9/20/2019 09:51:49	Seq Line:	5
Sample Name:	CLO4@ 5.0ug/L	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	5.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.770	PBA	276270.7	4.7724	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.787	PBA	92470.7	5.1417	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	213407.0	5.0000	CLO4-89-ISTD

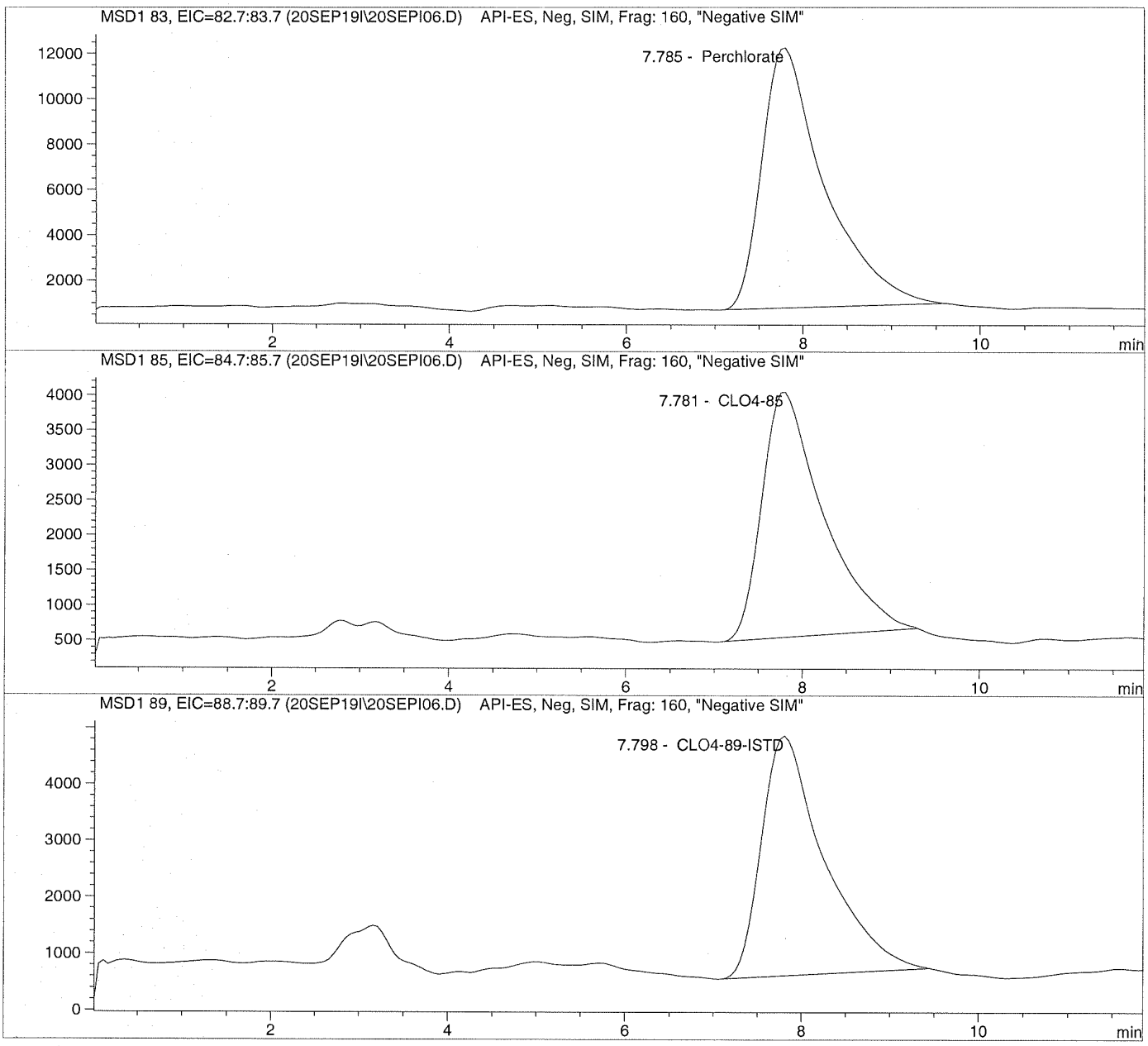
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI06.D Sample Name: CLO4@ 10.ug/L

Injection Date:	9/20/2019 10:05:36	Seq Line:	6
Sample Name:	CLO4@ 10.ug/L	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI06.D Sample Name: CLO4@ 10.ug/L

Injection Date:	9/20/2019 10:05:36	Seq Line:	6
Sample Name:	CLO4@ 10.ug/L	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	10.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.785	PBA	561297.7	9.7510	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.781	PBA	168622.4	9.5221	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.798	PBA	209246.3	5.0000	CLO4-89-ISTD

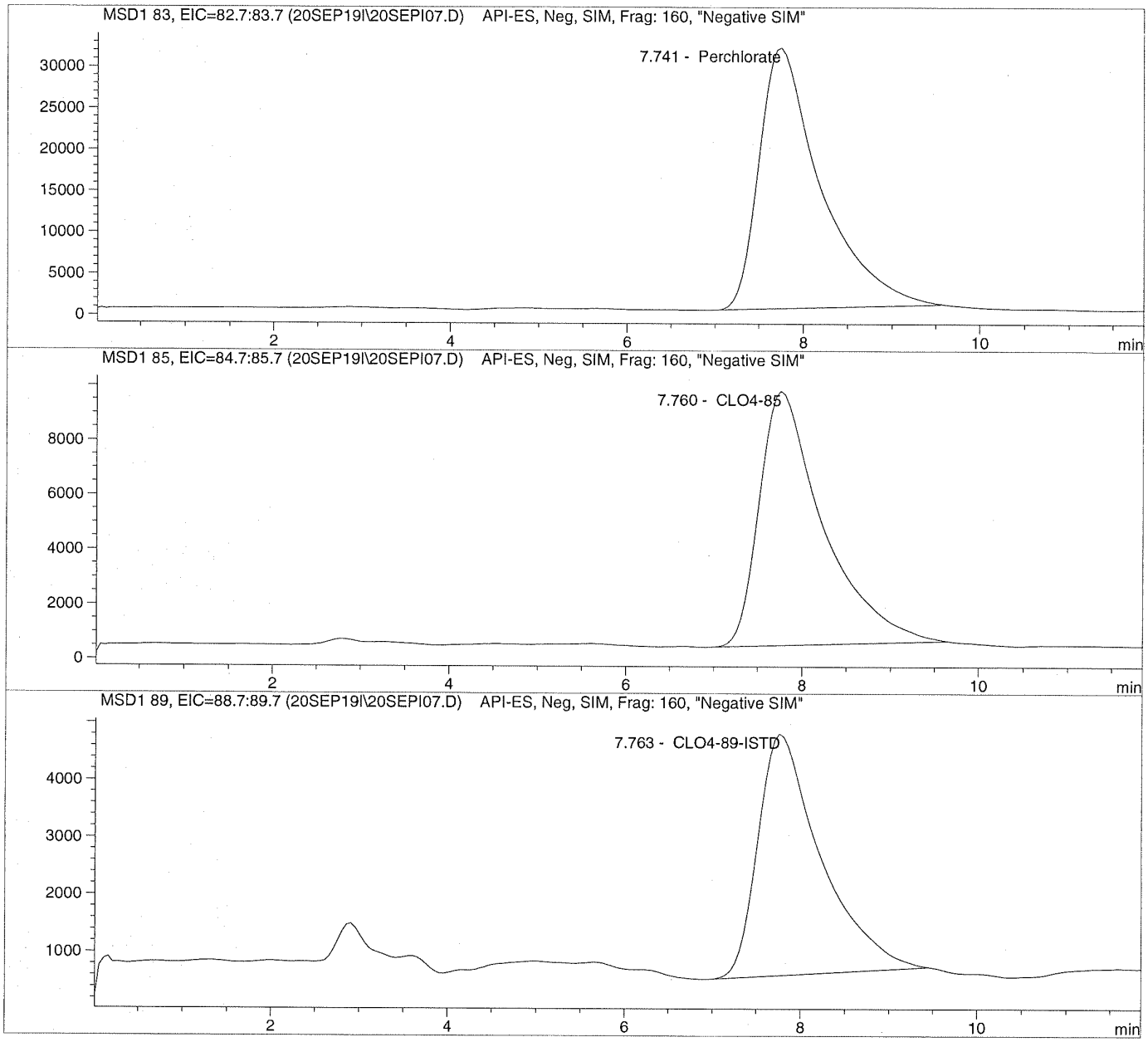
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	9/20/2019 10:19:23	Seq Line:	7
Sample Name:	CLO4@ 25.ug/L	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	9/20/2019 10:19:23	Seq Line:	7
Sample Name:	CLO4@ 25.ug/L	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.741	PBA	1518197.9	25.0108	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.760	PBA	463724.0	25.0492	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.763	PBA	207402.8	5.0000	CLO4-89-ISTD

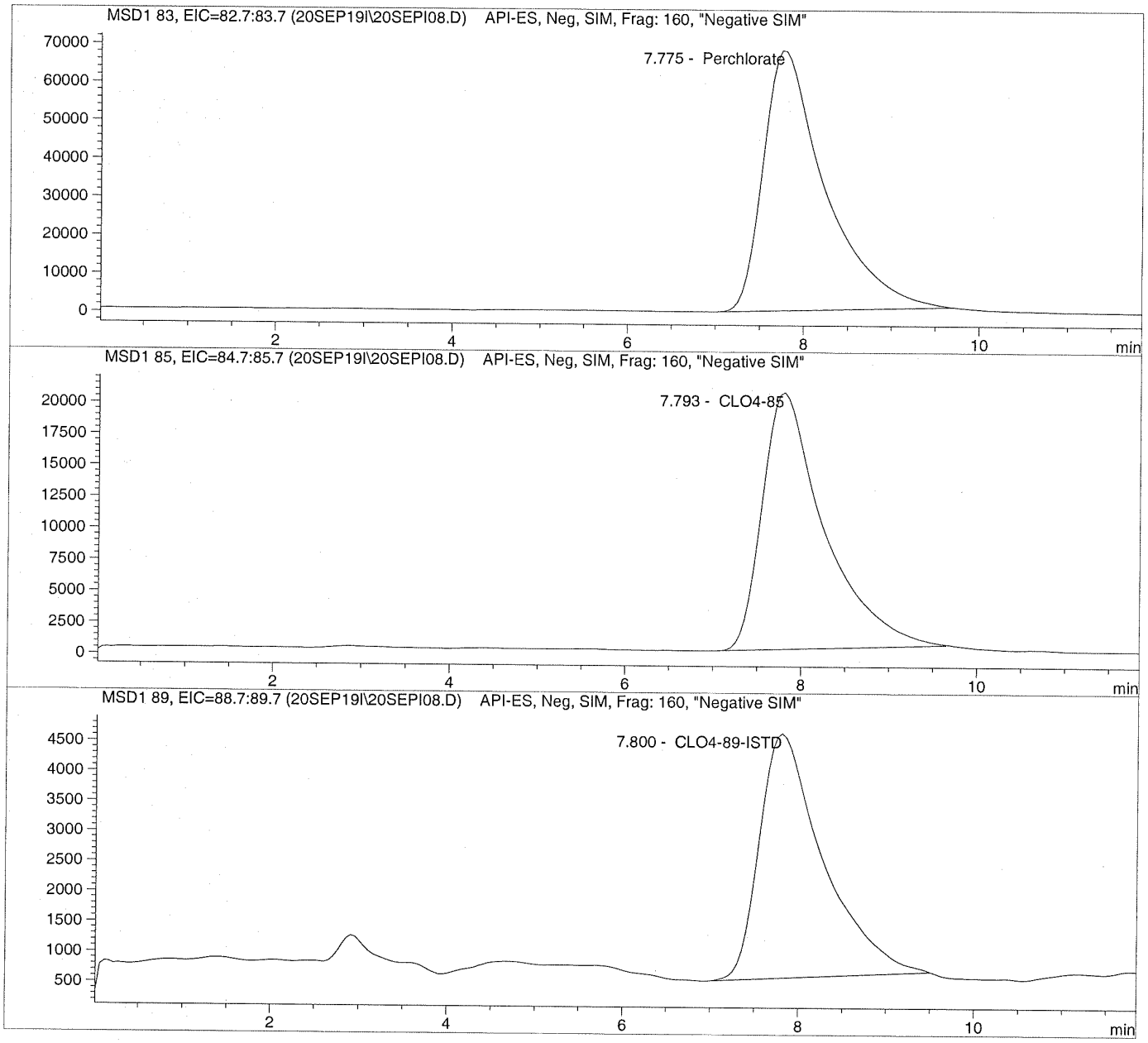
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI08.D Sample Name: CLO4@ 50.ug/L

Injection Date:	9/20/2019 10:33:18	Seq Line:	8
Sample Name:	CLO4@ 50.ug/L	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI08.D Sample Name: CLO4@ 50.ug/L

Injection Date:	9/20/2019 10:33:18	Seq Line:	8
Sample Name:	CLO4@ 50.ug/L	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	50.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.775	PBA	3311559.2	50.4030	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	995933.0	50.1422	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.800	PBA	202929.2	5.0000	CLO4-89-ISTD

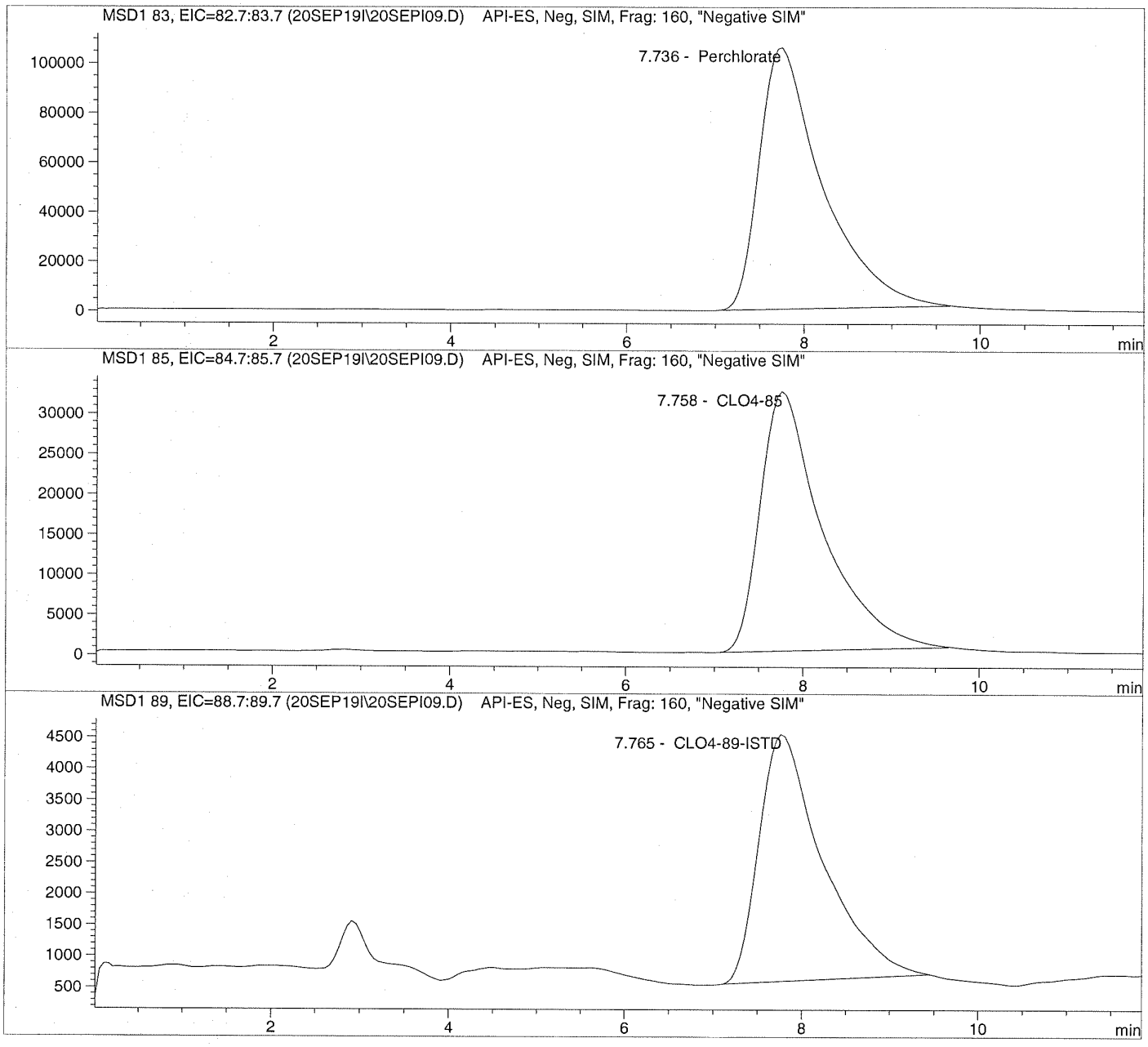
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	9/20/2019 10:47:05	Seq Line:	9
Sample Name:	CLO4@ 75.ug/L	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	9/20/2019 10:47:05	Seq Line:	9
Sample Name:	CLO4@ 75.ug/L	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 75.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.736	PBA	5239145.0	74.7911	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.758	PBA	1580664.2	74.9366	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.765	PBA	197932.5	5.0000	CLO4-89-ISTD

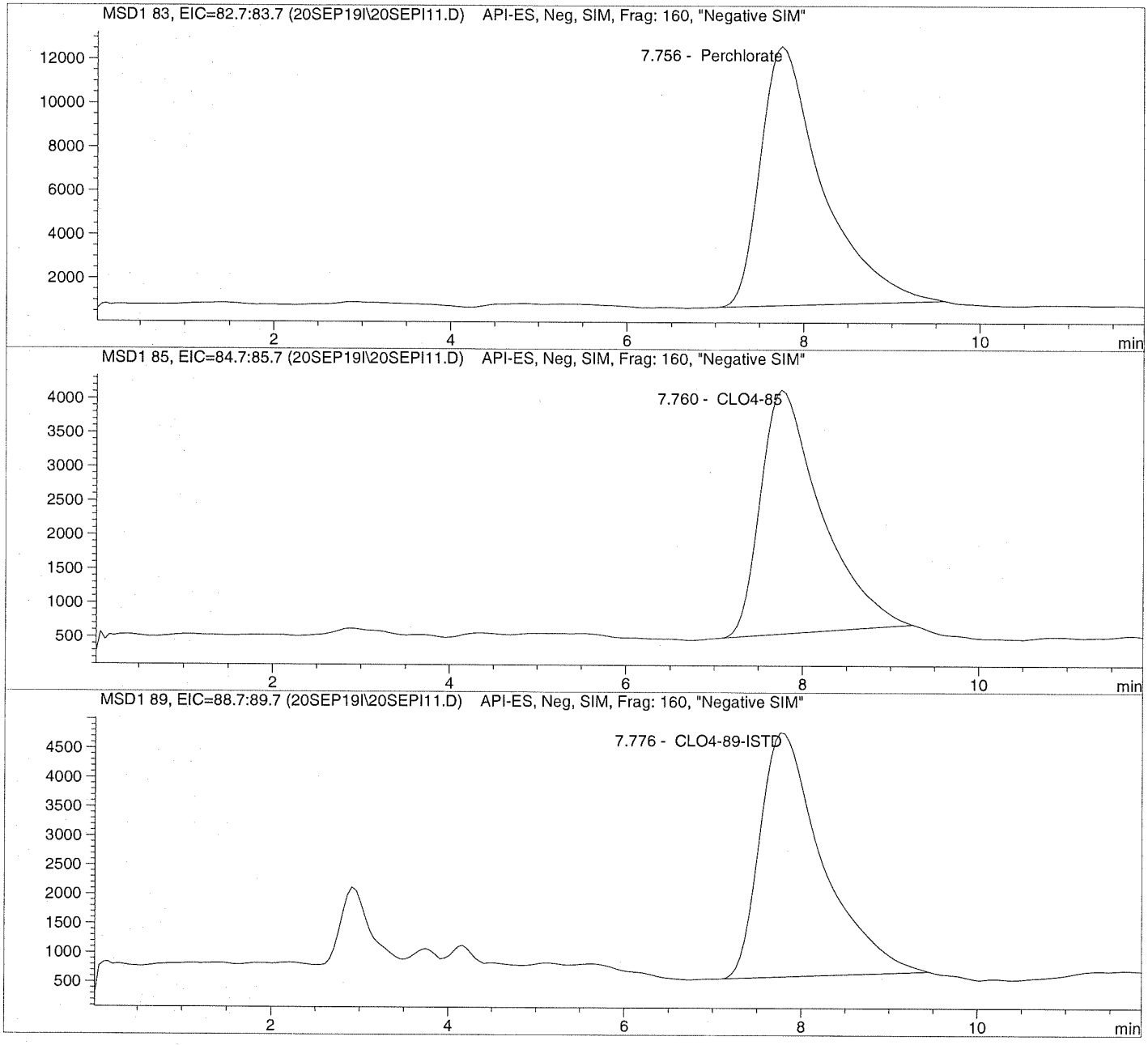
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI11.D Sample Name: ICAL Verf@10ug/L

Injection Date:	9/20/2019 11:14:45	Seq Line:	11
Sample Name:	ICAL Verf@10ug/L	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI11.D Sample Name: ICAL Verf@10ug/L

Injection Date:	9/20/2019 11:14:45	Seq Line:	11
Sample Name:	ICAL Verf@10ug/L	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	10.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.756	PBA	574879.4	10.1185	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.760	PBA	171000.4	9.7904	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.776	PBA	206243.3	5.0000	CLO4-89-ISTD

*** End of Report ***

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

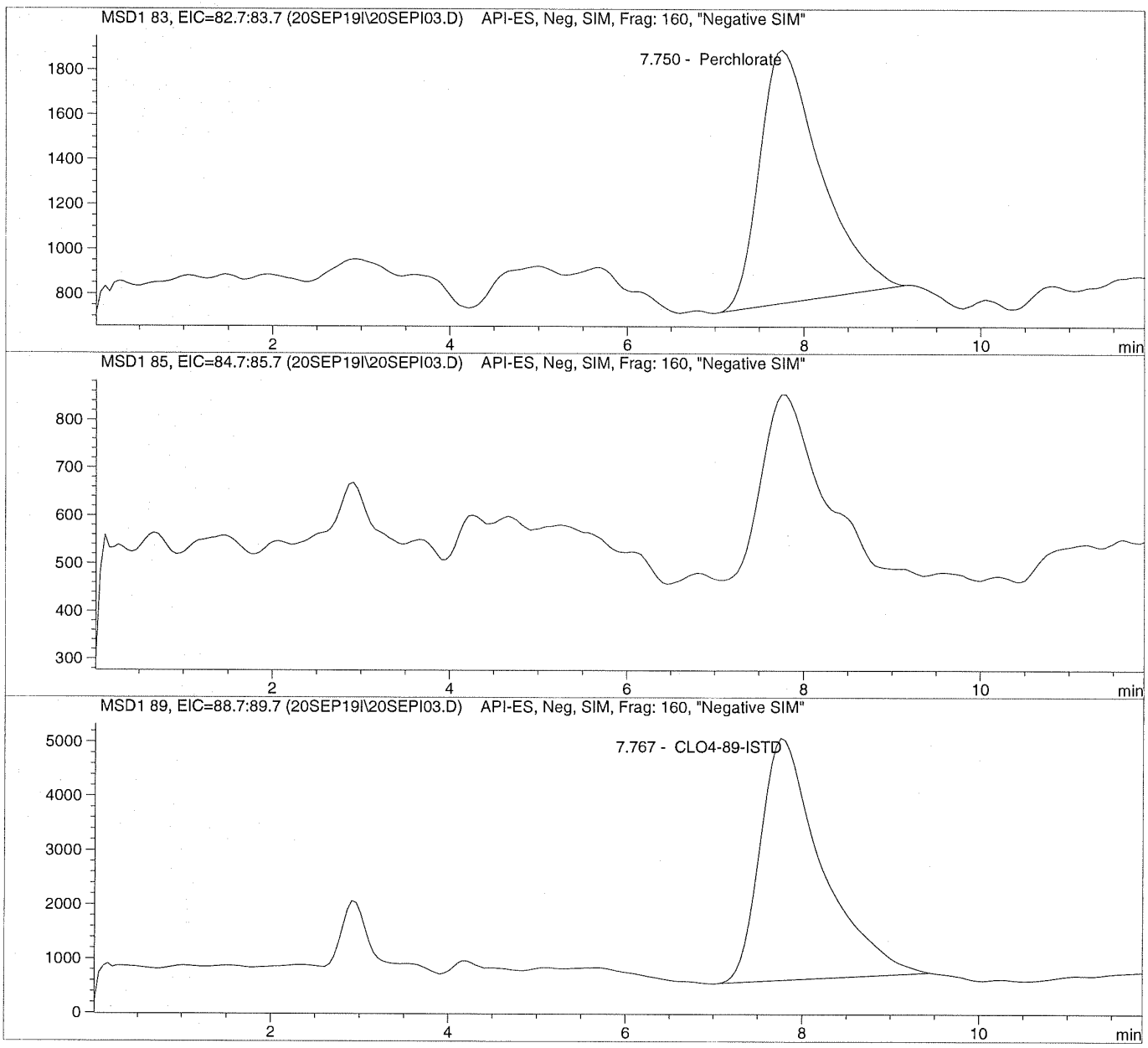
Unmodified

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 1.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.750	PBA	53921.8	0.8760	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.767	PBA	214568.1	5.0000	CLO4-89-ISTD

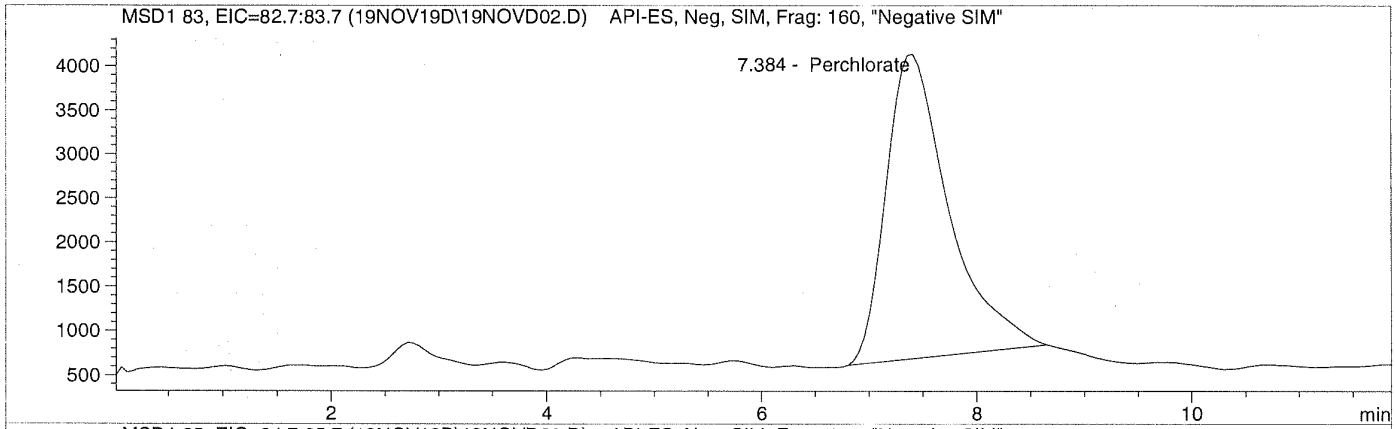
*** End of Report ***

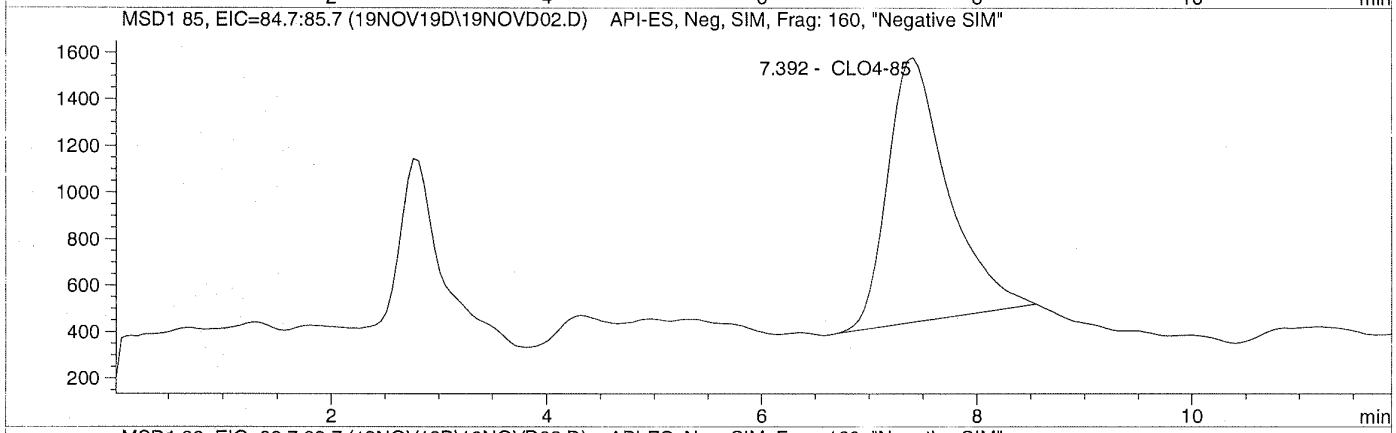
Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD02.D Sample Name: 684805 QC@3.0

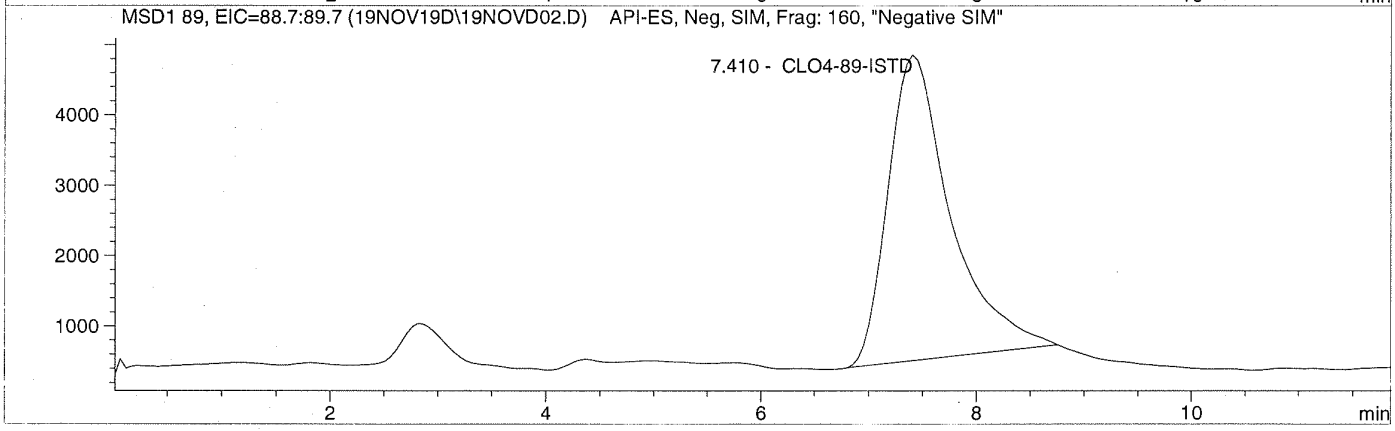
Injection Date:	11/19/2019 09:04:34	Seq Line:	2
Sample Name:	684805 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19NOV19D\19NOVD02.D Sample Name: 684805 QC@3.0

Injection Date:	11/19/2019 09:04:34	Seq Line:	2
Sample Name:	684805 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 11/5/2019 08:44:45

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	3.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.384	PBA	139068.9	2.9298	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.392	PBA	44210.1	2.9647	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.410	PBA	174596.2	5.0000	CLO4-89-ISTD

*** End of Report ***

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www.alsglobal.com

WorkOrder: HS19110796

LHAAP-50 501032

Aptim Environmental & Infrastucture, Inc.

Susan Huang
2500 City West Blvd., Suite 1700
Houston TX 77042

03-Dec-2019

RIGHT SOLUTIONS | RIGHT PARTNER

10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

December 03, 2019

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS19110796**

Laboratory Results for: **LHAAP-50 501032**

Dear Susan,

ALS Environmental received 4 sample(s) on Nov 15, 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: 03-Dec-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-50 501032
Work Order: HS19110796

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19110796-01	04WW09-191113-Post-inj	GW		13-Nov-2019 13:35	15-Nov-2019 08:45	☐
HS19110796-02	04WW05-191113-Post-inj	GW		13-Nov-2019 14:30	15-Nov-2019 08:45	☐
HS19110796-03	04WW07-191113-Post-inj	GW		13-Nov-2019 15:20	15-Nov-2019 08:45	☐
HS19110796-04	04WW010-191113-Post-inj	GW		13-Nov-2019 16:20	15-Nov-2019 08:45	☐

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ALS Houston, US Date: 03-Dec-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-50 501032
Work Order: HS19110796

CASE NARRATIVE

Work Order Comments

- The analysis for TOC was subcontracted to ALS Kelso WA. Final report attached.

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ALS Houston, US Date: 03-Dec-19

Client:	Aptim Environmental & Infrastucture, Inc.		**ANALYTICAL REPORT**
Project:	LHAAP-50 501032	WorkOrder:	HS19110796
Sample ID:	04WW09-191113-Post-inj	Lab ID:	HS19110796-01
Collection Date:	13-Nov-2019 13:35	Matrix:	GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Dec-2019 09:38

Note: See Qualifiers Page for a list of qualifiers and their explanation.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 03-Dec-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	LHAAP-50 501032	WorkOrder:HS19110796
Sample ID:	04WW05-191113-Post-inj	Lab ID:HS19110796-02
Collection Date:	13-Nov-2019 14:30	Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Dec-2019 09:38

Note: See Qualifiers Page for a list of qualifiers and their explanation.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 03-Dec-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	LHAAP-50 501032	WorkOrder:HS19110796
Sample ID:	04WW07-191113-Post-inj	Lab ID:HS19110796-03
Collection Date:	13-Nov-2019 15:20	Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Dec-2019 09:38

Note: See Qualifiers Page for a list of qualifiers and their explanation.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 03-Dec-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	LHAAP-50 501032	WorkOrder:HS19110796
Sample ID:	04WW010-191113-Post-inj	Lab ID:HS19110796-04
Collection Date:	13-Nov-2019 16:20	Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Dec-2019 09:38

Note: See Qualifiers Page for a list of qualifiers and their explanation.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 03-Dec-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-50 501032
WorkOrder: HS19110796

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R351628 (0)	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** GW	
HS19110796-01	04WW09-191113-Post-inj	13 Nov 2019 13:35			03 Dec 2019 09:38	1
HS19110796-02	04WW05-191113-Post-inj	13 Nov 2019 14:30			03 Dec 2019 09:38	1
HS19110796-03	04WW07-191113-Post-inj	13 Nov 2019 15:20			03 Dec 2019 09:38	1
HS19110796-04	04WW010-191113-Post-inj	13 Nov 2019 16:20			03 Dec 2019 09:38	1

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ALS Houston, US Date: 03-Dec-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-50 501032
WorkOrder: **HS19110796**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2019	31-Dec-2019
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	TX104704231-19-23	30-Apr-2020

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ALS Houston, US Date: 03-Dec-19

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS19110796

Date/Time Received: **15-Nov-2019 08:45**
Received by: **AC**

Checklist completed by: *Asad Chaudhry* (eSignature) 15-Nov-2019 (Date)

Reviewed by: *RJ Modashia* (eSignature) 15-Nov-2019 (Date)

Matrices: **Water**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☑	☐	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	0.9c U/C	IR 25
Cooler(s)/Kit(s):	42935	
Date/Time sample(s) sent to storage:	11/15/2019 15:00	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

Page 1 of 1

COC ID: LHAAP04 Post Injection Nov 2019-191113

TURNAROUND TIME: Standard

RUSH: No

PROJECT/CLIENT INFO			
Facility Name	Longhorn AAP		
Project Number	501032		
	LHAAP-50		
Address	1203-B East Grand Avenue		
	PMB 202		
City	Marshall	State	TX
Postal Code	75670	Country	USA
Phone Number	713.243.7264		
Project Manager	Praveen Srivastav		

LABORATORY			
Lab Name	ALS Laboratories		
Lab Contact	RJ Modashia		
Email	RJ Modashia@alsglobal.com		
Address	10450 Stancliff Rd , Suite 210		
City	Houston	State	TX
Postal Code	77099	Country	USA
Phone Number	281.575.2279 or 281 530.5656		

OTHER INFO			
Email Invoice To	FedInvoices@aptim.com		
Email Report To	Susan.Huang@aptim.com		
Mail Reports To	Susan Huang		
Address	4005 Port Chicago Highway, Suite 200		
City	Concord	State	CA
Postal Code	94520	Country	USA
Shipping Company			

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS: TOC by SM5310C
								Sample Container and Preservatives	2-40ml Amber/H2SO4
04WW09-191113-Post-Inj	LHAAP04 / 04WW09	3.81	4.1	FT	GW	11/13/2019	1335	2	2
04WW05-191113-Post-Inj	LHAAP04 / 04WW05	7.65	7.83	FT	GW	11/13/2019	1430	2	2
04WW07-191113-Post-Inj	LHAAP04 / 04WW07	8.85	9.26	FT	GW	11/13/2019	1520	2	2
04WW10-191113-Post-Inj	LHAAP04 / 04WW19	4.75	5.5	FT	GW	11/13/2019	1620	2	2

HS19110796

Aptim Environmental & Infrastucture, Inc.

LHAAP-50 501032

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	[illegible] APTIM	11/14/19 [illegible]	AIC.	11/15/19 03:45

42935 0.90 42.5 CP 0.0

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Houston, Texas 77099
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Fax. +1 281 530 5887

42935

CUSTODY SEAL

Date: 11-14-19 Time: 1825
Name: [illegible]
Company: [illegible]

Seal Broken By: SM
Date: 11/15/19

42935

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

42935

CUSTODY SEAL

Date: 11-14-19 Time: 1825
Name: [illegible]
Company: [illegible]

Seal Broken By: SM
Date: 11/15/19

Must Deliver Next Business Day
Time and Temperature Sensitive!

ALS

42935

ORIGIN ID:SGRA (903) 930-6193
SCOTT BEESINGER
APTIM ENVIROMENTAL & INFASTRUCTURE
1203-B EAST GRAND AVE
PMB 202
MARSHALL, TX 75670
UNITED STATES US

SHIP DATE: 07FEB19
ACTWGT: 1.00 LB MAN
CAD: 3001301/CAFF3108

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP-37-RJ
RMA:

FedEx Express

FedEx
TRK# (0221) 7376 9752 2644

FRI - 15 NOV 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US IAH

#475878 11/14 567J1/F330/0582

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December 02, 2019

Analytical Report for Service Request No: K1910847

RJ Modashia
ALS Laboratory Group
10450 Stancliff Road
Suite 210
Houston, TX 77099-4338

RE: HS19110796

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory November 16, 2019
For your reference, these analyses have been assigned our service request number **K1910847.**

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. 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.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

RIGHT SOLUTIONS | RIGHT PARTNER

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ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
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www.alsglobal.com

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Chain of Custody
General Chemistry
Raw Data
    General Chemistry

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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.

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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.

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	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 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/anlayte is offered by that state.

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Case Narrative

ALS Environmental—Kelso Laboratory
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ALS Environmental

Client: ALS Environmental - US
Project: HS19110796
Sample Matrix: Ground Water

Service Request: K1910847
Date Received: 11/16/2019

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:

Four ground water samples were received for analysis at ALS Environmental on 11/16/2019. 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 Kelley Lovejoy Date 12/02/2019

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Chain of Custody

ALS Environmental—Kelso Laboratory
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KL910847

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

SAMPLING STATE: **Texas** **COC ID:** **12645**

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:	HS19110796
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS19110796-01**	**04WW09-191113-Post-inj**	**GW**	**13 Nov 2019 13:35**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			03 Dec 2019
2.	**HS19110796-02**	**04WW05-191113-Post-inj**	**GW**	**13 Nov 2019 14:30**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			03 Dec 2019
3.	**HS19110796-03**	**04WW07-191113-Post-inj**	**GW**	**13 Nov 2019 15:20**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			03 Dec 2019
4.	**HS19110796-04**	**04WW010-191113-Post-inj**	**GW**	**13 Nov 2019 16:20**
	TOC Analysis with DOD Level IV/EQuIS APTIM EDD			03 Dec 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: 11/15/19 1800

Received By: A Rederson Date/Time: 11/16/19 1025

Cooler ID(s): _____ Temperature(s): _____

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PC KL

Cooler Receipt and Preservation Form

Client AIS Houston Service Request K19 10847

Received: 11/16/19 Opened: 11/16/19 By: AP Unloaded: 11/16/19 By: AP

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 NA	Tracking Number NA	Filed
-0.8	-0.6	0.2	0.4	0.2	402		1251 0791 8844	
						12645		
						12642		

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

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1910847
Project:	HS19110796	**Date Collected:**	11/13/19
Sample Matrix:	Ground Water	**Date Received:**	11/16/19
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
04WW09-191113-Post-inj	K1910847-001	**680**		10	4	2	20	11/23/19 22:55	
04WW05-191113-Post-inj	K1910847-002	**32.8**		0.50	0.20	0.07	1	11/23/19 23:23	
04WW07-191113-Post-inj	K1910847-003	**35.3**		0.50	0.20	0.07	1	11/23/19 23:51	
04WW010-191113-Post-inj	K1910847-004	**65**		10	4	2	20	11/26/19 13:58	
Method Blank	K1910847-MB1	ND	U	0.50	0.20	0.07	1	11/23/19 17:14	
Method Blank	K1910847-MB2	ND	U	0.50	0.20	0.07	1	11/26/19 13:13	

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ALS Group USA, Corp.
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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1910847
Project	HS19110796	**Date Collected:**	11/13/19
Sample Matrix:	Ground Water	**Date Received:**	11/16/19
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**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
04WW09-191113-Post-inj	K1910847-001DUP	10	4	2	680	676	678	<1	10	11/23/19
04WW05-191113-Post-inj	K1910847-002DUP	0.50	0.20	0.07	32.8	32.4	32.6	1	10	11/23/19
04WW07-191113-Post-inj	K1910847-003DUP	0.50	0.20	0.07	35.3	34.8	35.0	1	10	11/23/19
04WW010-191113-Post-inj	K1910847-004DUP	10	4	2	65	65	64.9	<1	10	11/26/19

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.

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1910847
Project:	HS19110796	**Date Analyzed:**	11/23/19
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	661076

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1910847-LCS1	24.7	25.0	99	83-117

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1910847
Project:	HS19110796	**Date Analyzed:**	11/26/19
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	661464

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1910847-LCS2	25.0	25.0	100	83-117

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QA/QC Report

Client: ALS Environmental - US **Service Request:** K1910847
Project: HS19110796

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	661076	KQ1917446-01	11/23/19 16:45	25.0	24.5	98	90-110
CCV2	661076	KQ1917446-02	11/23/19 21:01	25.0	24.6	98	90-110
CCV3	661076	KQ1917446-03	11/24/19 02:11	25.0	24.6	98	90-110
CCV4	661076	KQ1917446-04	11/24/19 06:54	25.0	24.2	97	90-110
CCV5	661464	KQ1917720-01	11/26/19 12:44	25.0	24.4	98	90-110
CCV6	661464	KQ1917720-02	11/26/19 17:01	25.0	24.8	99	90-110
CCV7	661464	KQ1917720-03	11/26/19 22:11	25.0	24.4	97	90-110
CCV8	661464	KQ1917720-04	11/27/19 02:54	25.0	24.6	98	90-110

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QA/QC Report

Client: ALS Environmental - US **Service Request:**K1910847
Project: HS19110796

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	661076	KQ1917446-05	11/23/19 16:59	0.50	0.20	0.07	ND	U
CCB2	661076	KQ1917446-06	11/23/19 21:15	0.50	0.20	0.07	ND	U
CCB3	661076	KQ1917446-07	11/24/19 02:26	0.50	0.20	0.07	ND	U
CCB4	661076	KQ1917446-08	11/24/19 07:09	0.50	0.20	0.07	ND	U
CCB5	661464	KQ1917720-05	11/26/19 12:59	0.50	0.20	0.07	ND	U
CCB6	661464	KQ1917720-06	11/26/19 17:15	0.50	0.20	0.07	ND	U
CCB7	661464	KQ1917720-07	11/26/19 22:26	0.50	0.20	0.07	ND	U
CCB8	661464	KQ1917720-08	11/27/19 03:09	0.50	0.20	0.07	ND	U

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Raw Data

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General Chemistry

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Work Request # Original (_____) K1910680, 796, 847, 861, 929, 969, 11031, 11032, 11033, 10803, 11028, 11032, 11047, 11049, 975, 11043

Tier: II IV IV II II I IV IV IV IV V IV II II I II

Date Analyzed: 11/23/19

TOC: 661076, 661077, 661078

Analyst: BCP

Run # DOC: 661079

Analysis: TOC/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?	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 ≥ 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: K1910847-4/4d, K1910803-2/2d, 803-4/4d sent for CA due to being above calibration curve.
K1910803-3/3d, 803-5/5d sent for CA due to sample carry over.
K1911043-2 sent for CA due to being overdiluted.
K1910680-2/2d, 680-4/4d, 680-5/5d, 796-2/2d, 929-2/2d, 11031-1/1d, 11028-3/3d, and 10975-1/1d report a high %RSD. However these samples are less than 5x the MRL.
K1911033-6/6d, 11033-7/7d, 10803-3, 10803-5, 11047-1/1d report a high %RSD due to suspected non-homogeneous samples.

Final Approved by: [signature] Date: 11/26/19

DQREPORT

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661076 **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?
K1910680-001	Carbon, Total Organic	N/A		Water	0.36 mg/L	10 ml	0.36 mg/L J	1	0.07	0.50			11/23/19 17:58	N
K1910680-002	Carbon, Total Organic	N/A		Water	0.30 mg/L	10 ml	0.30 mg/L J	1	0.07	0.50			11/23/19 18:26	N
K1910680-003	Carbon, Total Organic	N/A		Water	0.63 mg/L	10 ml	0.63 mg/L	1	0.07	0.50			11/23/19 18:54	N
K1910680-004	Carbon, Total Organic	N/A		Water	0.56 mg/L	10 ml	0.56 mg/L	1	0.07	0.50			11/23/19 19:22	N
K1910680-005	Carbon, Total Organic	N/A		Water	0.17 mg/L	10 ml	0.17 mg/L J	1	0.07	0.50			11/23/19 19:50	N
K1910796-001	Carbon, Total Organic	N/A		Ground Water	1.05 mg/L	10 ml	1.05 mg/L	1	0.07	0.50			11/23/19 21:30	N
K1910796-002	Carbon, Total Organic	N/A		Ground Water	0.88 mg/L	10 ml	0.88 mg/L	1	0.07	0.50			11/23/19 21:59	N
K1910796-003	Carbon, Total Organic	N/A		Ground Water	1.78 mg/L	10 ml	1.78 mg/L	1	0.07	0.50			11/23/19 22:27	N
K1910796-004	Carbon, Total Organic	N/A		Ground Water	0.20 mg/L	10 ml	0.20 mg/L J	1	0.07	0.50			11/23/19 20:18	Y
K1910847-001	Carbon, Total Organic	N/A		Ground Water	34.01 mg/L	10 ml	680 mg/L	20	2	10			11/23/19 22:55	N
K1910847-002	Carbon, Total Organic	N/A		Ground Water	32.82 mg/L	10 ml	32.8 mg/L	1	0.07	0.50			11/23/19 23:23	N
K1910847-003	Carbon, Total Organic	N/A		Ground Water	35.27 mg/L	10 ml	35.3 mg/L	1	0.07	0.50			11/23/19 23:51	N
K1910847-004	Carbon, Total Organic	N/A		Ground Water	61.27 mg/L	10 ml	61.3 mg/L	1	0.07	0.50			11/24/19 00:19	N
K1910861-001	Carbon, Total Organic	N/A		Water	7.26 mg/L	10 ml	726 mg/L	100	7	50			11/24/19 00:47	N
K1910861-002	Carbon, Total Organic	N/A		Water	5.98 mg/L	10 ml	598 mg/L	100	7	50			11/24/19 01:15	N
K1910861-003	Carbon, Total Organic	N/A		Water	5.96 mg/L	10 ml	596 mg/L	100	7	50			11/24/19 01:43	N
K1910861-004	Carbon, Total Organic	N/A		Water	7.78 mg/L	10 ml	778 mg/L	100	7	50			11/24/19 03:10	N
K1910861-005	Carbon, Total Organic	N/A		Water	7.46 mg/L	10 ml	746 mg/L	100	7	50			11/24/19 03:38	N
K1910861-006	Carbon, Total Organic	N/A		Water	10.75 mg/L	10 ml	1080 mg/L	100	7	50			11/24/19 04:06	N
K1910861-007	Carbon, Total Organic	N/A		Water	8.35 mg/L	10 ml	835 mg/L	100	7	50			11/24/19 04:34	N
KQ1917446-01	Carbon, Total Organic	CCV		Water	24.53 mg/L	10 ml	24.5 mg/L	1					11/23/19 16:45	N
KQ1917446-02	Carbon, Total Organic	CCV		Water	24.61 mg/L	10 ml	24.6 mg/L	1					11/23/19 21:01	N
KQ1917446-03	Carbon, Total Organic	CCV		Water	24.56 mg/L	10 ml	24.6 mg/L	1					11/24/19 02:11	N
KQ1917446-04	Carbon, Total Organic	CCV		Water	24.22 mg/L	10 ml	24.2 mg/L	1					11/24/19 06:54	N
KQ1917446-05	Carbon, Total Organic	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/23/19 16:59	N
KQ1917446-06	Carbon, Total Organic	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/23/19 21:15	N
KQ1917446-07	Carbon, Total Organic	CCB		Water	-0.01 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 02:26	N
KQ1917446-08	Carbon, Total Organic	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 07:09	N
KQ1917446-09	Carbon, Total Organic	MB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/23/19 17:14	N
KQ1917446-10	Carbon, Total Organic	LCS		Water	24.74 mg/L	10 ml	24.7 mg/L	1	0.07	0.50	99		11/23/19 17:29	N
KQ1917446-11	Carbon, Total Organic	MS	K1910796-004	Ground Water	22.48 mg/L	10 ml	22.5 mg/L	1	0.07	0.50	89		11/23/19 20:46	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

11/26/19

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661076 **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? T
KQ1917446-12	Carbon, Total Organic	DUP	K1910680-001	Water	0.36 mg/L	10 ml	0.36 mg/L J	1	0.07	0.50		2	11/23/19 17:58	N
KQ1917446-13	Carbon, Total Organic	DUP	K1910680-002	Water	0.26 mg/L	10 ml	0.26 mg/L J	1	0.07	0.50		13*	11/23/19 18:26	N
KQ1917446-14	Carbon, Total Organic	DUP	K1910680-003	Water	0.61 mg/L	10 ml	0.61 mg/L	1	0.07	0.50		3	11/23/19 18:54	N
KQ1917446-15	Carbon, Total Organic	DUP	K1910680-004	Water	0.67 mg/L	10 ml	0.67 mg/L	1	0.07	0.50		17*	11/23/19 19:22	N
KQ1917446-16	Carbon, Total Organic	DUP	K1910680-005	Water	0.20 mg/L	10 ml	0.20 mg/L J	1	0.07	0.50		15*	11/23/19 19:50	N
KQ1917446-17	Carbon, Total Organic	DUP	K1910796-002	Ground Water	0.77 mg/L	10 ml	0.77 mg/L	1	0.07	0.50		14*	11/23/19 21:59	N
KQ1917446-18	Carbon, Total Organic	DUP	K1910796-001	Ground Water	1.14 mg/L	10 ml	1.14 mg/L	1	0.07	0.50		8	11/23/19 21:30	N
KQ1917446-19	Carbon, Total Organic	DUP	K1910796-003	Ground Water	1.75 mg/L	10 ml	1.75 mg/L	1	0.07	0.50		1	11/23/19 22:27	N
KQ1917446-20	Carbon, Total Organic	DUP	K1910796-004	Ground Water	0.21 mg/L	10 ml	0.21 mg/L J	1	0.07	0.50		6	11/23/19 20:18	N
KQ1917446-21	Carbon, Total Organic	DUP	K1910847-002	Ground Water	32.44 mg/L	10 ml	32.4 mg/L	1	0.07	0.50		1	11/23/19 23:23	N
KQ1917446-22	Carbon, Total Organic	DUP	K1910847-001	Ground Water	33.78 mg/L	10 ml	676 mg/L	20	2	10		<1	11/23/19 22:55	N
KQ1917446-23	Carbon, Total Organic	DUP	K1910847-003	Ground Water	34.76 mg/L	10 ml	34.8 mg/L	1	0.07	0.50		1	11/23/19 23:51	N
KQ1917446-24	Carbon, Total Organic	DUP	K1910847-004	Ground Water	60.91 mg/L	10 ml	60.9 mg/L	1	0.07	0.50		<1	11/24/19 00:19	N
KQ1917446-25	Carbon, Total Organic	DUP	K1910861-001	Water	6.74 mg/L	10 ml	674 mg/L	100	7	50		7	11/24/19 00:47	N
KQ1917446-26	Carbon, Total Organic	DUP	K1910861-002	Water	5.82 mg/L	10 ml	582 mg/L	100	7	50		3	11/24/19 01:15	N
KQ1917446-27	Carbon, Total Organic	DUP	K1910861-003	Water	5.90 mg/L	10 ml	590 mg/L	100	7	50		1	11/24/19 01:43	N
KQ1917446-28	Carbon, Total Organic	DUP	K1910861-004	Water	7.76 mg/L	10 ml	776 mg/L	100	7	50		<1	11/24/19 03:10	N
KQ1917446-29	Carbon, Total Organic	DUP	K1910861-005	Water	7.41 mg/L	10 ml	741 mg/L	100	7	50		<1	11/24/19 03:38	N
KQ1917446-30	Carbon, Total Organic	DUP	K1910861-006	Water	10.62 mg/L	10 ml	1060 mg/L	100	7	50		1	11/24/19 04:06	N
KQ1917446-31	Carbon, Total Organic	DUP	K1910861-007	Water	8.16 mg/L	10 ml	816 mg/L	100	7	50		2	11/24/19 04:34	N

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661077 **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?
K1910929-001	Carbon, Total Organic	N/A		Water	1.49 mg/L	10 ml	1.49 mg/L	1	0.07	0.50			11/24/19 05:02	N
K1910929-002	Carbon, Total Organic	N/A		Water	0.79 mg/L	10 ml	0.79 mg/L	1	0.07	0.50			11/24/19 05:30	N
K1910929-003	Carbon, Total Organic	N/A		Water	1.91 mg/L	10 ml	1.91 mg/L	1	0.07	0.50			11/24/19 05:58	N
K1910969-002	Carbon, Total Organic	N/A		Drinking Water	1.16 mg/L	10 ml	1.16 mg/L	1	0.07	0.50			11/24/19 06:26	N
K1911031-001	Carbon, Total Organic	N/A		Water	0.90 mg/L	10 ml	0.90 mg/L	1	0.07	0.50			11/24/19 12:50	N
K1911032-001	Carbon, Total Organic	N/A		Ground Water	1.54 mg/L	10 ml	1.54 mg/L	1	0.07	0.50			11/24/19 13:19	N
K1911032-002	Carbon, Total Organic	N/A		Ground Water	1.55 mg/L	10 ml	1.55 mg/L	1	0.07	0.50			11/24/19 13:47	N
K1911032-003	Carbon, Total Organic	N/A		Ground Water	1.59 mg/L	10 ml	1.59 mg/L	1	0.07	0.50			11/24/19 14:15	N
K1911032-004	Carbon, Total Organic	N/A		Ground Water	2.02 mg/L	10 ml	2.02 mg/L	1	0.07	0.50			11/24/19 14:43	N
K1911032-005	Carbon, Total Organic	N/A		Ground Water	4.63 mg/L	10 ml	1850 mg/L	400	30	200			11/24/19 15:11	N
K1911032-006	Carbon, Total Organic	N/A		Ground Water	1.99 mg/L	10 ml	1.99 mg/L	1	0.07	0.50			11/24/19 15:39	N
K1911033-001	Carbon, Total Organic	N/A		Ground Water	3.66 mg/L	10 ml	3.66 mg/L	1	0.07	0.50			11/24/19 07:24	N
K1911033-002	Carbon, Total Organic	N/A		Ground Water	2.81 mg/L	10 ml	2.81 mg/L	1	0.07	0.50			11/24/19 07:52	N
K1911033-003	Carbon, Total Organic	N/A		Ground Water	2.80 mg/L	10 ml	2.80 mg/L	1	0.07	0.50			11/24/19 08:20	N
K1911033-004	Carbon, Total Organic	N/A		Ground Water	2.38 mg/L	10 ml	2.38 mg/L	1	0.07	0.50			11/24/19 08:48	N
K1911033-005	Carbon, Total Organic	N/A		Ground Water	39.57 mg/L	10 ml	791 mg/L	20	2	10			11/24/19 09:16	N
K1911033-006	Carbon, Total Organic	N/A		Ground Water	4.37 mg/L	10 ml	4.37 mg/L	1	0.07	0.50			11/24/19 09:44	N
K1911033-007	Carbon, Total Organic	N/A		Ground Water	2.51 mg/L	10 ml	2.51 mg/L	1	0.07	0.50			11/24/19 10:12	N
K1911033-008	Carbon, Total Organic	N/A		Ground Water	7.82 mg/L	10 ml	7820 mg/L	1000	70	500			11/24/19 10:41	N
K1911033-009	Carbon, Total Organic	N/A		Ground Water	3.94 mg/L	10 ml	3.94 mg/L	1	0.07	0.50			11/24/19 11:09	Y
KQ1917447-01	Carbon, Total Organic	CCV		Water	24.56 mg/L	10 ml	24.6 mg/L	1					11/24/19 02:11	N
KQ1917447-02	Carbon, Total Organic	CCV		Water	24.22 mg/L	10 ml	24.2 mg/L	1					11/24/19 06:54	N
KQ1917447-03	Carbon, Total Organic	CCV		Water	24.73 mg/L	10 ml	24.7 mg/L	1					11/24/19 11:51	N
KQ1917447-04	Carbon, Total Organic	CCV		Water	24.32 mg/L	10 ml	24.3 mg/L	1					11/24/19 16:22	N
KQ1917447-05	Carbon, Total Organic	CCB		Water	-0.01 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 02:26	N
KQ1917447-06	Carbon, Total Organic	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 07:09	N
KQ1917447-07	Carbon, Total Organic	CCB		Water	0.23 mg/L	10 ml	0.23 mg/L J	1	0.07	0.50			11/24/19 12:06	N
KQ1917447-08	Carbon, Total Organic	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 16:36	N

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11/26/19

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661077 **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?
KQ1917447-09	Carbon, Total Organic	MB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 02:41	N
KQ1917447-10	Carbon, Total Organic	LCS		Water	25.09 mg/L	10 ml	25.1 mg/L	1	0.07	0.50	100		11/24/19 02:55	N
KQ1917447-11	Carbon, Total Organic	MS	K1911033-009	Ground Water	26.11 mg/L	10 ml	52.2 mg/L	2	0.2	1.0	97		11/24/19 11:37	N
KQ1917447-12	Carbon, Total Organic	DUP	K1910929-001	Water	1.39 mg/L	10 ml	1.39 mg/L	1	0.07	0.50		7	11/24/19 05:02	N
KQ1917447-13	Carbon, Total Organic	DUP	K1910929-002	Water	0.88 mg/L	10 ml	0.88 mg/L	1	0.07	0.50		11*	11/24/19 05:30	N
KQ1917447-14	Carbon, Total Organic	DUP	K1910929-003	Water	1.94 mg/L	10 ml	1.94 mg/L	1	0.07	0.50		2	11/24/19 05:58	N
KQ1917447-15	Carbon, Total Organic	DUP	K1910969-002	Drinking Water	1.11 mg/L	10 ml	1.11 mg/L	1	0.07	0.50		5	11/24/19 06:26	N
KQ1917447-16	Carbon, Total Organic	DUP	K1911031-001	Water	0.79 mg/L	10 ml	0.79 mg/L	1	0.07	0.50		13*	11/24/19 12:50	N
KQ1917447-17	Carbon, Total Organic	DUP	K1911032-002	Ground Water	1.60 mg/L	10 ml	1.60 mg/L	1	0.07	0.50		3	11/24/19 13:47	N
KQ1917447-18	Carbon, Total Organic	DUP	K1911032-001	Ground Water	1.42 mg/L	10 ml	1.42 mg/L	1	0.07	0.50		8	11/24/19 13:19	N
KQ1917447-19	Carbon, Total Organic	DUP	K1911032-003	Ground Water	1.50 mg/L	10 ml	1.50 mg/L	1	0.07	0.50		5	11/24/19 14:15	N
KQ1917447-20	Carbon, Total Organic	DUP	K1911032-004	Ground Water	1.87 mg/L	10 ml	1.87 mg/L	1	0.07	0.50		8	11/24/19 14:43	N
KQ1917447-21	Carbon, Total Organic	DUP	K1911032-005	Ground Water	4.83 mg/L	10 ml	1930 mg/L	400	30	200		4	11/24/19 15:11	N
KQ1917447-22	Carbon, Total Organic	DUP	K1911032-006	Ground Water	1.82 mg/L	10 ml	1.82 mg/L	1	0.07	0.50		9	11/24/19 15:39	N
KQ1917447-23	Carbon, Total Organic	DUP	K1911033-001	Ground Water	3.65 mg/L	10 ml	3.65 mg/L	1	0.07	0.50		<1	11/24/19 07:24	N
KQ1917447-24	Carbon, Total Organic	DUP	K1911033-002	Ground Water	2.74 mg/L	10 ml	2.74 mg/L	1	0.07	0.50		3	11/24/19 07:52	N
KQ1917447-25	Carbon, Total Organic	DUP	K1911033-003	Ground Water	2.76 mg/L	10 ml	2.76 mg/L	1	0.07	0.50		1	11/24/19 08:20	N
KQ1917447-26	Carbon, Total Organic	DUP	K1911033-004	Ground Water	2.31 mg/L	10 ml	2.31 mg/L	1	0.07	0.50		3	11/24/19 08:48	N
KQ1917447-27	Carbon, Total Organic	DUP	K1911033-005	Ground Water	38.77 mg/L	10 ml	775 mg/L	20	2	10		2	11/24/19 09:16	N
KQ1917447-28	Carbon, Total Organic	DUP	K1911033-006	Ground Water	3.18 mg/L	10 ml	3.18 mg/L	1	0.07	0.50		31*	11/24/19 09:44	N
KQ1917447-29	Carbon, Total Organic	DUP	K1911033-007	Ground Water	2.24 mg/L	10 ml	2.24 mg/L	1	0.07	0.50		11*	11/24/19 10:12	N
KQ1917447-30	Carbon, Total Organic	DUP	K1911033-008	Ground Water	8.01 mg/L	10 ml	8010 mg/L	1000	70	500		2	11/24/19 10:41	N
KQ1917447-31	Carbon, Total Organic	DUP	K1911033-009	Ground Water	3.61 mg/L	10 ml	3.61 mg/L	1	0.07	0.50		9	11/24/19 11:09	N

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661078 **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?
K1910803-001	Carbon, Total Organic	N/A		Water	43.43 mg/L	10 ml	43.4 mg/L	1	0.07	0.50			11/24/19 17:19	N
K1910803-002	Carbon, Total Organic	N/A		Water	119.98 mg/L	10 ml	120 mg/L	1	0.07	0.50			11/24/19 17:47	N
K1910803-003	Carbon, Total Organic	N/A		Water	21.79 mg/L	10 ml	21.8 mg/L	1	0.07	0.50			11/24/19 18:15	N
K1910803-004	Carbon, Total Organic	N/A		Water	67.32 mg/L	10 ml	67.3 mg/L	1	0.07	0.50			11/24/19 18:43	N
K1910803-005	Carbon, Total Organic	N/A		Water	39.95 mg/L	10 ml	39.9 mg/L	1	0.07	0.50			11/24/19 19:11	N
K1910803-006	Carbon, Total Organic	N/A		Water	14.93 mg/L	10 ml	14.9 mg/L	1	0.07	0.50			11/24/19 19:40	N
K1911028-001	Carbon, Total Organic	N/A		Water	0.89 mg/L	10 ml	0.89 mg/L	1	0.07	0.50			11/25/19 00:24	N
K1911028-002	Carbon, Total Organic	N/A		Water	22.10 mg/L	10 ml	22.1 mg/L	1	0.07	0.50			11/25/19 00:52	N
K1911028-003	Carbon, Total Organic	N/A		Water	0.73 mg/L	10 ml	0.73 mg/L	1	0.07	0.50			11/25/19 01:21	N
K1911028-004	Carbon, Total Organic	N/A		Water	1.41 mg/L	10 ml	1.41 mg/L	1	0.07	0.50			11/25/19 02:18	N
K1911028-005	Carbon, Total Organic	N/A		Water	1.44 mg/L	10 ml	1.44 mg/L	1	0.07	0.50			11/25/19 02:47	N
K1911032-007	Carbon, Total Organic	N/A		Ground Water	4.08 mg/L	10 ml	4.08 mg/L	1	0.07	0.50			11/24/19 16:51	Y
K1911047-001	Carbon, Total Organic	N/A		Water	3.61 mg/L	10 ml	361 mg/L	100	7	50			11/24/19 20:08	N
K1911047-002	Carbon, Total Organic	N/A		Water	26.84 mg/L	10 ml	2680 mg/L	100	7	50			11/24/19 20:36	N
K1911049-001	Carbon, Total Organic	N/A		Water	4.21 mg/L	10 ml	84 mg/L	20	2	10			11/24/19 21:04	N
K1911049-002	Carbon, Total Organic	N/A		Water	9.04 mg/L	10 ml	181 mg/L	20	2	10			11/24/19 22:31	Y
K1911049-003	Carbon, Total Organic	N/A		Water	11.75 mg/L	10 ml	11.7 mg/L	1	0.07	0.50			11/24/19 23:28	N
K1911049-004	Carbon, Total Organic	N/A		Water	1.62 mg/L	10 ml	1.62 mg/L	1	0.07	0.50			11/24/19 23:56	N
KQ1917448-01	Carbon, Total Organic	CCV		Ground Water	24.73 mg/L	10 ml	24.7 mg/L	1					11/24/19 11:51	N
KQ1917448-02	Carbon, Total Organic	CCV		Ground Water	24.32 mg/L	10 ml	24.3 mg/L	1					11/24/19 16:22	N
KQ1917448-03	Carbon, Total Organic	CCV		Ground Water	24.63 mg/L	10 ml	24.6 mg/L	1					11/24/19 21:32	N
KQ1917448-04	Carbon, Total Organic	CCV		Ground Water	24.22 mg/L	10 ml	24.2 mg/L	1					11/25/19 01:49	N
KQ1917448-05	Carbon, Total Organic	CCV		Ground Water	24.12 mg/L	10 ml	24.1 mg/L	1					11/25/19 06:19	N
KQ1917448-06	Carbon, Total Organic	CCB		Ground Water	0.23 mg/L	10 ml	0.23 mg/L J	1	0.07	0.50			11/24/19 12:06	N
KQ1917448-07	Carbon, Total Organic	CCB		Ground Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 16:36	N
KQ1917448-08	Carbon, Total Organic	CCB		Ground Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/24/19 21:47	N
KQ1917448-09	Carbon, Total Organic	CCB		Ground Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/25/19 02:04	N
KQ1917448-10	Carbon, Total Organic	CCB		Ground Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/25/19 06:34	N
KQ1917448-11	Carbon, Total Organic	MB		Ground Water	0.14 mg/L	10 ml	0.14 mg/L J	1	0.07	0.50			11/24/19 12:21	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

11/26/19

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661078 **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?	T
KQ1917448-12	Carbon, Total Organic	LCS		Ground Water	24.93 mg/L	10 ml	24.9 mg/L	1	0.07	0.50	100		11/24/19 12:36	N	
KQ1917448-13	Carbon, Total Organic	MS	K1911032-007	Ground Water	26.35 mg/L	10 ml	52.7 mg/L	2	0.2	1.0	97		11/24/19 16:07	N	
KQ1917448-14	Carbon, Total Organic	MS	K1911049-002	Water	29.03 mg/L	10 ml	2900 mg/L	100	7	50	109		11/24/19 22:59	N	
KQ1917448-15	Carbon, Total Organic	DUP	K1910803-002	Water	122.07 mg/L	10 ml	122 mg/L	1	0.07	0.50		2	11/24/19 17:47	N	
KQ1917448-16	Carbon, Total Organic	DUP	K1910803-003	Water	18.16 mg/L	10 ml	18.2 mg/L	1	0.07	0.50		18*	11/24/19 18:15	N	
KQ1917448-17	Carbon, Total Organic	DUP	K1910803-004	Water	69.64 mg/L	10 ml	69.6 mg/L	1	0.07	0.50		3	11/24/19 18:43	N	
KQ1917448-18	Carbon, Total Organic	DUP	K1910803-005	Water	22.58 mg/L	10 ml	22.6 mg/L	1	0.07	0.50		56*	11/24/19 19:11	N	
KQ1917448-19	Carbon, Total Organic	DUP	K1910803-006	Water	13.68 mg/L	10 ml	13.7 mg/L	1	0.07	0.50		9	11/24/19 19:40	N	
KQ1917448-20	Carbon, Total Organic	DUP	K1910803-001	Water	44.82 mg/L	10 ml	44.8 mg/L	1	0.07	0.50		3	11/24/19 17:19	N	
KQ1917448-21	Carbon, Total Organic	DUP	K1911028-003	Water	0.66 mg/L	10 ml	0.66 mg/L	1	0.07	0.50		11*	11/25/19 01:21	N	
KQ1917448-22	Carbon, Total Organic	DUP	K1911028-004	Water	1.38 mg/L	10 ml	1.38 mg/L	1	0.07	0.50		2	11/25/19 02:18	N	
KQ1917448-23	Carbon, Total Organic	DUP	K1911028-005	Water	1.42 mg/L	10 ml	1.42 mg/L	1	0.07	0.50		1	11/25/19 02:47	N	
KQ1917448-24	Carbon, Total Organic	DUP	K1911028-001	Water	0.82 mg/L	10 ml	0.82 mg/L	1	0.07	0.50		9	11/25/19 00:24	N	
KQ1917448-25	Carbon, Total Organic	DUP	K1911028-002	Water	21.52 mg/L	10 ml	21.5 mg/L	1	0.07	0.50		3	11/25/19 00:52	N	
KQ1917448-26	Carbon, Total Organic	DUP	K1911032-007	Ground Water	4.18 mg/L	10 ml	4.18 mg/L	1	0.07	0.50		2	11/24/19 16:51	N	
KQ1917448-27	Carbon, Total Organic	DUP	K1911047-001	Water	3.03 mg/L	10 ml	303 mg/L	100	7	50		18*	11/24/19 20:08	N	
KQ1917448-28	Carbon, Total Organic	DUP	K1911047-002	Water	26.76 mg/L	10 ml	2680 mg/L	100	7	50		<1	11/24/19 20:36	N	
KQ1917448-29	Carbon, Total Organic	DUP	K1911049-001	Water	3.99 mg/L	10 ml	80 mg/L	20	2	10		5	11/24/19 21:04	N	
KQ1917448-30	Carbon, Total Organic	DUP	K1911049-002	Water	8.98 mg/L	10 ml	179 mg/L	20	2	10		<1	11/24/19 22:31	N	
KQ1917448-31	Carbon, Total Organic	DUP	K1911049-003	Water	11.81 mg/L	10 ml	11.8 mg/L	1	0.07	0.50		<1	11/24/19 23:28	N	
KQ1917448-32	Carbon, Total Organic	DUP	K1911049-004	Water	1.50 mg/L	10 ml	1.50 mg/L	1	0.07	0.50		8	11/24/19 23:56	N	

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661079 **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?
K1910975-001	Carbon, Dissolved Organic (DOC)	N/A		Water	0.89 mg/L	10 ml	0.89 mg/L	1	0.07	0.50			11/25/19 05:08	N
K1910975-002	Carbon, Dissolved Organic (DOC)	N/A		Water	7.97 mg/L	10 ml	79.7 mg/L	10	0.7	5.0			11/25/19 04:40	N
K1911043-001	Carbon, Dissolved Organic (DOC)	N/A		Water	11.72 mg/L	10 ml	11700 mg/L	1000	70	500			11/25/19 03:44	N
K1911043-002.R01	Carbon, Dissolved Organic (DOC)	N/A		Water	-0.04 mg/L	10 ml	500 mg/L U	1000	70	500			11/25/19 04:12	N
KQ1917449-01	Carbon, Dissolved Organic (DOC)	CCV		Water	-0.04 mg/L	10 ml	-0.0368 mg/L	1					11/24/19 22:01	N
KQ1917449-02	Carbon, Dissolved Organic (DOC)	CCV		Water	24.12 mg/L	10 ml	24.1 mg/L	1					11/25/19 06:19	N
KQ1917449-03	Carbon, Dissolved Organic (DOC)	CCB		Water	24.68 mg/L	10 ml	24.7 mg/L	1	0.07	0.50			11/24/19 22:16	N
KQ1917449-04	Carbon, Dissolved Organic (DOC)	CCB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/25/19 06:34	N
KQ1917449-05	Carbon, Dissolved Organic (DOC)	MB		Water	-0.04 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/25/19 01:49	N
KQ1917449-06	Carbon, Dissolved Organic (DOC)	LCS		Water	24.22 mg/L	10 ml	24.2 mg/L	1	0.07	0.50	97		11/25/19 02:04	N
KQ1917449-07	Carbon, Dissolved Organic (DOC)	MS	K1910975-001	Water	26.58 mg/L	10 ml	26.6 mg/L	1	0.07	0.50	103		11/25/19 05:36	N
KQ1917449-08	Carbon, Dissolved Organic (DOC)	DUP	K1910975-001	Water	0.72 mg/L	10 ml	0.72 mg/L	1	0.07	0.50		21*	11/25/19 05:08	N
KQ1917449-09	Carbon, Dissolved Organic (DOC)	DUP	K1910975-002	Water	8.27 mg/L	10 ml	82.7 mg/L	10	0.7	5.0		4	11/25/19 04:40	N
KQ1917449-10	Carbon, Dissolved Organic (DOC)	DUP	K1911043-001	Water	11.71 mg/L	10 ml	11700 mg/L	1000	70	500		<1	11/25/19 03:44	N
KQ1917449-11	Carbon, Dissolved Organic (DOC)	DUP	K1911043-002	Water	-0.04 mg/L	10 ml	500 mg/L U	1000	70	500		NC	11/25/19 04:12	N

11/26/19

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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0.031	0.031	#DIV/0!	#DIV/0!	OBSERVATIONS	13	0.031
0.000				STD Deviation	0.08537	0
0.000				AVERAGE	0.03675	0
0.000				UCL	0.12213	0
0.000				LCL	-0.04862	0
0.000						0
0.270						ABOVE
0.177				OBSERVATIONS	1	ABOVE
0.000				STD Deviation	#DIV/0!	0
0.000				AVERAGE	0.03100	0
0.000				UCL	#DIV/0!	0
0.000				LCL	#DIV/0!	0
0.000						0
						0
				OBSERVATIONS	0	0
				STD Deviation	#DIV/0!	0
				AVERAGE	#DIV/0!	0
				UCL	#DIV/0!	0
				LCL	#DIV/0!	0
						0
						0
				OBSERVATIONS	0	0
				STD Deviation	#DIV/0!	0
				AVERAGE	#DIV/0!	0
						0
						0
						0
						0
						0
						0

11/26/19

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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	ccv	1	24.567	0.0368	24.5300	24.52995	24.5	11/23/2019
3	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/23/2019
4	mb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/23/2019
5	lcs	1	24.774	0.0368	24.7370	24.73695	24.7	11/23/2019
6	K1910680-001	1	0.394	0.0368	0.3575	0.35745	<0.5	11/23/2019
7	K1910680-001	1	0.400	0.0368	0.3632	0.36315	<0.5	11/23/2019
8	K1910680-002	1	0.336	0.0368	0.2995	0.29945	<0.5	11/23/2019
9	K1910680-002	1	0.301	0.0368	0.2638	0.26375	<0.5	11/23/2019
10	K1910680-003	1	0.665	0.0368	0.6281	0.62805	0.63	11/23/2019
11	K1910680-003	1	0.645	0.0368	0.6085	0.60845	0.6	11/23/2019
12	K1910680-004	1	0.598	0.0368	0.5611	0.56105	0.56	11/23/2019
13	K1910680-004	1	0.704	0.0368	0.6673	0.66725	0.67	11/23/2019
14	K1910680-005	1	0.209	0.0368	0.1722	0.17215	<0.5	11/23/2019
15	K1910680-005	1	0.237	0.0368	0.1999	0.19985	<0.5	11/23/2019
16	K1910796-004	1	0.235	0.0368	0.1982	0.19815	<0.5	11/23/2019
17	K1910796-004	1	0.247	0.0368	0.2103	0.21025	<0.5	11/23/2019
18	KQ1917446-11	1	22.520	0.0368	22.4829	22.48285	22.5	11/23/2019
19	ccv	1	24.651	0.0368	24.6140	24.61395	24.6	11/23/2019
20	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/23/2019
21	K1910796-001	1	1.085	0.0368	1.0481	1.04805	1.05	11/23/2019
22	K1910796-001	1	1.173	0.0368	1.1367	1.13665	1.1	11/23/2019
23	K1910796-002	1	0.917	0.0368	0.8806	0.88055	0.9	11/23/2019
24	K1910796-002	1	0.803	0.0368	0.7659	0.76585	0.77	11/23/2019
25	K1910796-003	1	1.814	0.0368	1.7772	1.77715	1.78	11/23/2019

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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

23 BKD 11/26/19 date time

Analyzed By: BKD	Date Analyzed 11/26/19
Reviewed By:	Date Reviewed 11/26/19

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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	K1910796-003	1	1.791	0.0368	1.7545	1.75445	1.75	11/23/2019
27	K1910847-001	20	34.048	0.0368	34.0116	680.231	680.23	11/23/2019
28	K1910847-001	20	33.816	0.0368	33.7788	675.575	675.6	11/23/2019
29	K1910847-002	1	32.858	0.0368	32.8211	32.82105	32.8	11/23/2019
30	K1910847-002	1	32.481	0.0368	32.4447	32.44465	32.4	11/23/2019
31	K1910847-003	1	35.302	0.0368	35.2656	35.26555	35.3	11/23/2019
32	K1910847-003	1	34.801	0.0368	34.7641	34.76405	34.8	11/23/2019
33	K1910847-004	1	61.309	0.0368	61.2726	61.27255	61.3	11/24/2019
34	K1910847-004	1	60.948	0.0368	60.9109	60.91085	60.9	11/24/2019
35	K1910861-001	100	7.292	0.0368	7.2555	725.545	725.5	11/24/2019
36	K1910861-001	100	6.781	0.0368	6.7447	674.465	674.5	11/24/2019
37	K1910861-002	100	6.013	0.0368	5.9758	597.575	597.6	11/24/2019
38	K1910861-002	100	5.852	0.0368	5.8151	581.505	581.5	11/24/2019
39	K1910861-003	100	5.998	0.0368	5.9616	596.155	596.2	11/24/2019
40	K1910861-003	100	5.934	0.0368	5.8973	589.725	589.7	11/24/2019
41	ccv	1	24.592	0.0368	24.5555	24.55545	24.6	11/24/2019
42	ccb	1	0.031	0.0368	-0.0058	-0.00575	<0.5	11/24/2019
43	K1910861-004	100	7.819	0.0368	7.7823	778.225	778.2	11/24/2019
44	K1910861-004	100	7.801	0.0368	7.7640	776.395	776.4	11/24/2019
45	K1910861-005	100	7.497	0.0368	7.4601	746.005	746.0	11/24/2019
46	K1910861-005	100	7.442	0.0368	7.4053	740.525	740.5	11/24/2019
47	K1910861-006	100	10.791	0.0368	10.7546	1075.455	1075.5	11/24/2019
48	K1910861-006	100	10.652	0.0368	10.6153	1061.525	1061.5	11/24/2019
49	K1910861-007	100	8.384	0.0368	8.3476	834.755	834.8	11/24/2019
50	K1910861-007	100	8.194	0.0368	8.1568	815.675	815.7	11/24/2019

Analyzed By: BCD	Date Analyzed 11/23/19
Reviewed By: [signature]	Date Reviewed 11/26/19

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	
51	ccv	1	24.259	0.0368	24.2227	24.22265	24.22	11/24/2019
52	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
53		1		0.0000	0.0000	0	<0.5	
54		1		0.0000	0.0000	0	<0.5	
55		1		0.0000	0.0000	0	<0.5	
56		1		0.0000	0.0000	0	<0.5	
57		1		0.0000	0.0000	0	<0.5	
58		1		0.0000	0.0000	0	<0.5	
59		1		0.0000	0.0000	0	<0.5	
60		1		0.0000	0.0000	0	<0.5	
61		1		0.0000	0.0000	0	<0.5	
62		1		0.0000	0.0000	0	<0.5	
63		1		0.0000	0.0000	0	<0.5	
64		1		0.0000	0.0000	0	<0.5	
65		1		0.0000	0.0000	0	<0.5	
66		1		0.0000	0.0000	0	<0.5	
67		1		0.0000	0.0000	0	<0.5	
68		1		0.0000	0.0000	0	<0.5	
69		1		0.0000	0.0000	0	<0.5	
70		1		0.0000	0.0000	0	<0.5	
71		1		0.0000	0.0000	0	<0.5	
72		1		0.0000	0.0000	0	<0.5	
73		1		0.0000	0.0000	0	<0.5	
74		1		0.0000	0.0000	0	<0.5	
75		1		0.0000	0.0000	0	<0.5	

Analyzed By: BCD	Date Analyzed 11/25/19
Reviewed By: [illegible]	Date Reviewed 11/26/19

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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	ccv	1	24.592	0.0368	24.5555	24.55545	24.6	11/24/2019
3	ccb	1	0.031	0.0368	-0.0058	-0.00575	<0.5	11/24/2019
4	mb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
5	lcs	1	25.123	0.0368	25.0866	25.08655	25.1	11/24/2019
6	K1910929-001	1	1.527	0.0368	1.4898	1.48975	1.49	11/24/2019
7	K1910929-001	1	1.429	0.0368	1.3918	1.39175	1.4	11/24/2019
8	K1910929-002	1	0.827	0.0368	0.7902	0.79015	1	11/24/2019
9	K1910929-002	1	0.919	0.0368	0.8820	0.88195	0.88	11/24/2019
10	K1910929-003	1	1.943	0.0368	1.9064	1.90635	1.91	11/24/2019
11	K1910929-003	1	1.976	0.0368	1.9391	1.93905	1.9	11/24/2019
12	K1910969-002	1	1.201	0.0368	1.1638	1.16375	1.16	11/24/2019
13	K1910969-002	1	1.147	0.0368	1.1100	1.10995	1.11	11/24/2019
14	ccv	1	24.259	0.0368	24.2227	24.22265	24.22	11/24/2019
15	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
16	K1911033-001	1	3.696	0.0368	3.6588	3.65875	3.7	11/24/2019
17	K1911033-001	1	3.684	0.0368	3.6472	3.64715	3.65	11/24/2019
18	K1911033-002	1	2.845	0.0368	2.8083	2.80825	2.8	11/24/2019
19	K1911033-002	1	2.775	0.0368	2.7385	2.73845	2.7	11/24/2019
20	K1911033-003	1	2.836	0.0368	2.7992	2.79915	2.80	11/24/2019
21	K1911033-003	1	2.795	0.0368	2.7582	2.75815	2.76	11/24/2019
22	K1911033-004	1	2.422	0.0368	2.3849	2.38485	2.4	11/24/2019
23	K1911033-004	1	2.347	0.0368	2.3104	2.31035	2.3	11/24/2019
24	K1911033-005	20	39.603	0.0368	39.5660	791.319	791.32	11/24/2019
25	K1911033-005	20	38.802	0.0368	38.7653	775.305	775.31	11/24/2019

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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By: BCP	Date Analyzed	11/23/19	
Reviewed By: [signature]	Date Reviewed	11/26/19	

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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	K1911033-006	1	4.402	0.0368	4.3652	4.36515	4.37	11/24/2019
27	K1911033-006	1	3.221	0.0368	3.1843	3.18425	3.18	11/24/2019
28	K1911033-007	1	2.543	0.0368	2.5060	2.50595	2.5	11/24/2019
29	K1911033-007	1	2.273	0.0368	2.2363	2.23625	2.2	11/24/2019
30	K1911033-008	1000	7.861	0.0368	7.8241	7824.05	7824.1	11/24/2019
31	K1911033-008	1000	8.044	0.0368	8.0074	8007.35	8007.4	11/24/2019
32	K1911033-009	1	3.972	0.0368	3.9355	3.93545	3.9	11/24/2019
33	K1911033-009	1	3.647	0.0368	3.6099	3.60985	3.6	11/24/2019
34	KQ1917447-11	2	26.144	0.0368	26.1076	52.2151	52.2	11/24/2019
35	ccv	1	24.762	0.0368	24.7255	24.72545	24.7	11/24/2019
36	ccb	1	0.270	0.0368	0.2328	0.23275	<0.5	11/24/2019
37	K1911031-001	1	0.934	0.0368	0.8970	0.89695	0.9	11/24/2019
38	K1911031-001	1	0.826	0.0368	0.7890	0.78895	0.8	11/24/2019
39	K1911032-001	1	1.580	0.0368	1.5437	1.54365	1.5	11/24/2019
40	K1911032-001	1	1.458	0.0368	1.4216	1.42155	1.4	11/24/2019
41	K1911032-002	1	1.585	0.0368	1.5487	1.54865	1.5	11/24/2019
42	K1911032-002	1	1.638	0.0368	1.6012	1.60115	1.6	11/24/2019
43	K1911032-003	1	1.623	0.0368	1.5864	1.58635	1.6	11/24/2019
44	K1911032-003	1	1.541	0.0368	1.5038	1.50375	1.5	11/24/2019
45	K1911032-004	1	2.055	0.0368	2.0187	2.01865	2.0	11/24/2019
46	K1911032-004	1	1.904	0.0368	1.8668	1.86675	1.9	11/24/2019
47	K1911032-005	400	4.671	0.0368	4.6341	1853.62	1853.6	11/24/2019
48	K1911032-005	400	4.867	0.0368	4.8300	1931.98	1932.0	11/24/2019
49	K1911032-006	1	2.028	0.0368	1.9917	1.99165	2.0	11/24/2019
50	K1911032-006	1	1.861	0.0368	1.8238	1.82375	1.8	11/24/2019

Analyzed By: BCD	Date Analyzed 11/23/19
Reviewed By: [signature]	Date Reviewed 11/26/19

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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	
51	ccv	1	24.356	0.0368	24.3194	24.31935	24.32	11/24/2019
52	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
53		1		0.0000	0.0000	0	<0.5	
54		1		0.0000	0.0000	0	<0.5	
55		1		0.0000	0.0000	0	<0.5	
56		1		0.0000	0.0000	0	<0.5	
57		1		0.0000	0.0000	0	<0.5	
58		1		0.0000	0.0000	0	<0.5	
59		1		0.0000	0.0000	0	<0.5	
60		1		0.0000	0.0000	0	<0.5	
61		1		0.0000	0.0000	0	<0.5	
62		1		0.0000	0.0000	0	<0.5	
63		1		0.0000	0.0000	0	<0.5	
64		1		0.0000	0.0000	0	<0.5	
65		1		0.0000	0.0000	0	<0.5	
66		1		0.0000	0.0000	0	<0.5	
67		1		0.0000	0.0000	0	<0.5	
68		1		0.0000	0.0000	0	<0.5	
69		1		0.0000	0.0000	0	<0.5	
70		1		0.0000	0.0000	0	<0.5	
71		1		0.0000	0.0000	0	<0.5	
72		1		0.0000	0.0000	0	<0.5	
73		1		0.0000	0.0000	0	<0.5	
74		1		0.0000	0.0000	0	<0.5	
75		1		0.0000	0.0000	0	<0.5	

Analyzed By: BCP	Date Analyzed 11/23/19
Reviewed By:	Date Reviewed 11/26/19

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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	ccv	1	24.762	0.0368	24.7255	24.72545	24.7	11/24/2019
3	ccb	1	0.270	0.0368	0.2328	0.23275	<0.5	11/24/2019
4	mb	1	0.177	0.0368	0.1406	0.14055	<0.5	11/24/2019
5	lcs	1	24.962	0.0368	24.9254	24.92535	24.9	11/24/2019
6	KQ1917448-13	2	26.387	0.0368	26.3507	52.7013	52.70	11/24/2019
7	ccv	1	24.356	0.0368	24.3194	24.31935	24.3	11/24/2019
8	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
9	K1911032-007	1	4.121	0.0368	4.0838	4.08375	4.08	11/24/2019
10	K1911032-007	1	4.215	0.0368	4.1781	4.17805	4.18	11/24/2019
11	K1910803-001	1	43.462	0.0368	43.4256	43.42555	43.4	11/24/2019
12	K1910803-001	1	44.855	0.0368	44.8186	44.81855	44.82	11/24/2019
13	K1910803-002	1	120.019	0.0368	119.9820	119.98195	119.98	11/24/2019
14	K1910803-002	1	122.103	0.0368	122.0664	122.06635	122.07	11/24/2019
15	K1910803-003	1	21.826	0.0368	21.7893	21.78925	21.8	11/24/2019
16	K1910803-003	1	18.201	0.0368	18.1638	18.16375	18.2	11/24/2019
17	K1910803-004	1	67.352	0.0368	67.3154	67.31535	67.32	11/24/2019
18	K1910803-004	1	69.680	0.0368	69.6435	69.64345	69.6	11/24/2019
19	K1910803-005	1	39.984	0.0368	39.9477	39.94765	39.9	11/24/2019
20	K1910803-005	1	22.612	0.0368	22.5756	22.57555	22.58	11/24/2019
21	K1910803-006	1	14.967	0.0368	14.9307	14.93065	14.93	11/24/2019
22	K1910803-006	1	13.722	0.0368	13.6848	13.68475	13.7	11/24/2019
23	K1911047-001	100	3.650	0.0368	3.6131	361.305	361.3	11/24/2019
24	K1911047-001	100	3.066	0.0368	3.0297	302.965	302.97	11/24/2019
25	K1911047-002	100	26.873	0.0368	26.8364	2683.635	2683.64	11/24/2019

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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By: BCD	Date Analyzed	11/23/19	
Reviewed By:	Date Reviewed	11/26/19	

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

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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	K1911047-002	100	26.799	0.0368	26.7618	2676.175	2676.18	11/24/2019
27	K1911049-001	20	4.249	0.0368	4.2124	84.247	84.25	11/24/2019
28	K1911049-001	20	4.029	0.0368	3.9925	79.849	79.8	11/24/2019
29	ccv	1	24.669	0.0368	24.6320	24.63195	24.6	11/24/2019
30	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
31	K1911049-002	20	9.079	0.0368	9.0426	180.851	180.9	11/24/2019
32	K1911049-002	20	9.012	0.0368	8.9750	179.499	179.5	11/24/2019
33	KQ1917448-14	100	29.072	0.0368	29.0348	2903.475	2903.5	11/24/2019
34	K1911049-003	1	11.784	0.0368	11.7471	11.74705	11.7	11/24/2019
35	K1911049-003	1	11.848	0.0368	11.8116	11.81155	11.8	11/24/2019
36	K1911049-004	1	1.659	0.0368	1.6225	1.62245	1.6	11/24/2019
37	K1911049-004	1	1.541	0.0368	1.5039	1.50385	1.5	11/24/2019
38	K1911028-001	1	0.932	0.0368	0.8949	0.89485	0.9	11/25/2019
39	K1911028-001	1	0.858	0.0368	0.8217	0.82165	0.8	11/25/2019
40	K1911028-002	1	22.140	0.0368	22.1030	22.10295	22.1	11/25/2019
41	K1911028-002	1	21.561	0.0368	21.5239	21.52385	21.5	11/25/2019
42	K1911028-003	1	0.771	0.0368	0.7346	0.73455	0.7	11/25/2019
43	K1911028-003	1	0.696	0.0368	0.6592	0.65915	0.7	11/25/2019
44	ccv	1	24.254	0.0368	24.2171	24.21705	24.2	11/25/2019
45	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/25/2019
46	K1911028-004	1	1.442	0.0368	1.4057	1.40565	1.4	11/25/2019
47	K1911028-004	1	1.412	0.0368	1.3753	1.37525	1.4	11/25/2019
48	K1911028-005	1	1.478	0.0368	1.4409	1.44085	1.4	11/25/2019
49	K1911028-005	1	1.461	0.0368	1.4244	1.42435	1.4	11/25/2019
50	ccv	1	24.161	0.0368	24.1246	24.12455	24.1	11/25/2019

Analyzed By: BW	Date Analyzed 11/23/19
Reviewed By: [signature]	Date Reviewed 11/26/19

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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	
51	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/25/2019
52		1		0.0000	0.0000	0	<0.5	
53		1		0.0000	0.0000	0	<0.5	
54		1		0.0000	0.0000	0	<0.5	
55		1		0.0000	0.0000	0	<0.5	
56		1		0.0000	0.0000	0	<0.5	
57		1		0.0000	0.0000	0	<0.5	
58		1		0.0000	0.0000	0	<0.5	
59		1		0.0000	0.0000	0	<0.5	
60		1		0.0000	0.0000	0	<0.5	
61		1		0.0000	0.0000	0	<0.5	
62		1		0.0000	0.0000	0	<0.5	
63		1		0.0000	0.0000	0	<0.5	
64		1		0.0000	0.0000	0	<0.5	
65		1		0.0000	0.0000	0	<0.5	
66		1		0.0000	0.0000	0	<0.5	
67		1		0.0000	0.0000	0	<0.5	
68		1		0.0000	0.0000	0	<0.5	
69		1		0.0000	0.0000	0	<0.5	
70		1		0.0000	0.0000	0	<0.5	
71		1		0.0000	0.0000	0	<0.5	
72		1		0.0000	0.0000	0	<0.5	
73		1		0.0000	0.0000	0	<0.5	
74		1		0.0000	0.0000	0	<0.5	
75		1		0.0000	0.0000	0	<0.5	

Analyzed By: BCP	Date Analyzed 11/25/19
Reviewed By: [illegible]	Date Reviewed 11/26/19

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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	mb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/24/2019
3	lcs	1	24.714	0.0368	24.6774	24.67735	24.7	11/24/2019
4	ccv	1	24.254	0.0368	24.2171	24.21705	24.2	11/25/2019
5	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/25/2019
6	K1911043-001	1000	11.760	0.0368	11.7231	11723.05	11723.05	11/25/2019
7	K1911043-001	1000	11.743	0.0368	11.7062	11706.15	11706.2	11/25/2019
8	K1911043-002	1000	0.000	0.0368	-0.0368	-36.75	<0.5	11/25/2019
9	K1911043-002	1000	0.000	0.0368	-0.0368	-36.75	<0.5	11/25/2019
10	K1910975-002	10	8.002	0.0368	7.9657	79.6565	79.66	11/25/2019
11	K1910975-002	10	8.302	0.0368	8.2651	82.6505	82.7	11/25/2019
12	K1910975-001	1	0.922	0.0368	0.8852	0.88515	0.89	11/25/2019
13	K1910975-001	1	0.756	0.0368	0.7189	0.71885	0.72	11/25/2019
14	KQ1917449-07	1	26.613	0.0368	26.5764	26.57635	26.58	11/25/2019
15	ccv	1	24.161	0.0368	24.1246	24.12455	24.1	11/25/2019
16	ccb	1	0.000	0.0368	-0.0368	-0.03675	<0.5	11/25/2019
17		1		0.0000	0.0000	0	<0.5	
18		1		0.0000	0.0000	0	<0.5	
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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By: RD	Date Analyzed	11/23/19	
Reviewed By: [signature]	Date Reviewed	11/26/19	

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

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TOC: 661076, 661077, 661078
DOC: 661079

Schedule: 11232019

Version: 8
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2019/11/23 17:20 - Saturday

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	K1910680-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
4	Sample	K1910680-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
5	Sample	K1910680-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
6	Sample	K1910680-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
7	Sample	K1910680-005.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
8	Sample	K1910796-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
9	Sample	K1910796-004.01 ms	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
10	Sample	K1910796-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
11	Sample	K1910796-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
12	Sample	K1910796-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
13	Sample	K1910847-001.01 20x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
14	Sample	K1910847-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
15	Sample	K1910847-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
16	Sample	K1910847-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
17	Sample	K1910861-001.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
18	Sample	K1910861-002.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
19	Sample	K1910861-003.01 100x	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	K1910861-004.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
22	Sample	K1910861-005.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
23	Sample	K1910861-006.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
24	Sample	K1910861-007.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
25	Sample	K1910929-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
26	Sample	K1910929-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
27	Sample	K1910929-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
28	Sample	K1910969-002.01	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
29	Sample	K1911033-001.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
30	Sample	K1911033-002.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
31	Sample	K1911033-003.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
32	Sample	K1911033-004.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
33	Sample	K1911033-005.03 20x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
34	Sample	K1911033-006.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
35	Sample	K1911033-007.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
36	Sample	K1911033-008.03 1000x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
37	Sample	K1911033-009.08	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
38	Sample	K1911033-009.08 ms 2x	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

Printed on: November 26, 2019 09:09:30

11/26/19

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Schedule: 11232019

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps	Use	State
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
39	Sample	MB3	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
C	Check Standard	[TOC] LCS [25.0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
40	Sample	K1911031-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
41	Sample	K1911032-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
42	Sample	K1911032-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
43	Sample	K1911032-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
44	Sample	K1911032-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
45	Sample	K1911032-005.01 400x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
46	Sample	K1911032-006.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
47	Sample	K1911032-007.03 ms 2x	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
48	Sample	K1911032-007.03	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
49	Sample	K1910803-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
50	Sample	K1910803-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
51	Sample	K1910803-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
52	Sample	K1910803-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
53	Sample	K1910803-005.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
54	Sample	K1910803-006.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
55	Sample	K1911047-001.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
56	Sample	K1911047-002.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
57	Sample	K1911049-001.01 20x	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
58	Sample	MB4	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
C	Check Standard	[TOC] LCS [25.0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
59	Sample	K1911049-002.01 20x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
60	Sample	K1911049-002.01 ms 100x	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
61	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
62	Sample	K1911049-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
63	Sample	K1911049-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
64	Sample	K1911028-001.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
65	Sample	K1911028-002.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
66	Sample	K1911028-003.04	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
67	Sample	K1911028-004.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
68	Sample	K1911028-005.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
69	Sample	FB 11/21/19	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
70	Sample	FB 11/22/19	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
71	Sample	K1911043-001.01 doc 1000x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
72	Sample	K1911043-002.01 doc 1000x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
73	Sample	K1910975-002.01 doc 10x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
74	Sample	K1910975-001.01 doc	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
75	Sample	K1910975-001.01 ms doc	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
61	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	

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Fusion Report - 11232019
Saturday, November 23, 2019 02:23 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2019/11/26 09:09 - Tuesday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	11232019	Engine Version:	1.1.5.1
Instrument Name:	Fusion1	Firmware Version:	1.2.0696
Report Version:	1 of 1	Connection:	RS232 COM1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v2) Fusion1 (Fusion1) (v3) Fusion1 (Fusion1) (v4) Fusion1 (Fusion1) (v5) Fusion1 (Fusion1) (v6) Fusion1 (Fusion1) (v7) Fusion1 (Fusion1) (v8)		
Comment:			

11/26/19

Report Results

Sample Type: Clean

From Schedule Version 2

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/23 14:23

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	13.02	17.16	4.14	49.59	05:26
2	TC Clean	7.50	10.99	3.49	49.85	07:19
3	TC Clean	2.01	5.61	3.60	49.88	07:04
4	TC Clean	1.40	5.11	3.71	49.85	07:02

Sample Type: Clean

From Schedule Version 3

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/23 14:55

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.72	15.29	3.57	49.65	05:23

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2	TC Clean	3.64	7.23	3.59	49.87	07:17
3	TC Clean	1.59	5.34	3.74	49.87	07:02
4	TC Clean	1.19	4.93	3.74	49.91	07:02

Sample Type: Clean From Schedule Version 4

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/23 15:34

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.48	15.13	3.65	49.68	05:24
2	TC Clean	3.90	7.40	3.51	50.02	04:07
3	TC Clean	1.55	5.07	3.52	50.06	03:50
4	TC Clean	1.18	4.74	3.56	50.06	03:48

Sample Type: Blank (Creating v1323) From Schedule Version 5

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2019/11/23 15:56

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.31	14.93	3.62	49.60	05:13
2	TC Clean	3.39	7.01	3.62	50.04	04:06
3	TC Clean	1.31	4.93	3.61	50.06	03:48
4	TC Clean	1.45	4.95	3.50	50.05	03:47
5	Reagent Blank	4.02	7.68	3.66	50.07	05:09
6	Acid Blank	1.14	4.93	3.79	49.74	05:31

Sample Type: Sample From Schedule Version 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.0324 ppm	0.0000 ppm	0.0000%	2019/11/23 16:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0324	0.3238	9.00	12.79	3.79	50.19	10:34

Dilution **Blank Contribution** **Method** **Calibration**

1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 7

	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)	24.5667 ppm (PASS)	0.0000 ppm	0%	2019/11/23 16:45

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5667	245.6673	176.22	180.09	3.87	50.19	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 7

	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%	2019/11/23 16:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.20	10.93	3.73	50.19	10:29

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 7

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/23 17:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.91	9.77	3.86	50.22	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 8

	Pos	BAT	Concentration	Dil	Sample ID	Min / Max	Result	Std. Dev.	RSD	Start Time

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			(ppm)			(% dev)				
◈	C	TOC	25.0000	1:1	[TOC] LCS [24.0 ppm]	0 / infinity (NA / NA)	24.7737 ppm (PASS)	0.0000 ppm	0%	2019/11/23 17:29

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	24.7737	247.7372	177.62	181.34	3.71	50.22	10:32

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	2	TOC	ICS	0.0515 ppm	0.0000 ppm	0.0000%	2019/11/23 17:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0515	0.5154	9.13	12.75	3.61	50.28	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	K1910680-001.01	0.3971 ppm	0.0041 ppm	1.0200%	2019/11/23 17:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3942	3.9420	11.46	15.12	3.66	50.22	10:23
2	TOC	0.3999	3.9995	11.50	15.20	3.70	50.24	10:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1910680-002.01	0.3183 ppm	0.0252 ppm	7.9200%	2019/11/23 18:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3362	3.3616	11.07	14.56	3.49	50.27	10:28
2	TOC	0.3005	3.0051	10.82	14.32	3.50	50.24	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1910680-003.01	0.6550 ppm	0.0139 ppm	2.1200%	2019/11/23 18:54

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Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.6648	6.6483	13.30	17.08	3.79	50.23	10:28
2	TOC	0.6452	6.4524	13.16	16.93	3.77	50.22	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1910680-004.01	0.6509 ppm	0.0751 ppm	11.5400%	2019/11/23 19:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.5978	5.9780	12.84	16.55	3.71	50.24	10:25
2	TOC	0.7040	7.0402	13.56	17.06	3.50	50.21	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	K1910680-005.03	0.2227 ppm	0.0196 ppm	8.7900%	2019/11/23 19:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2089	2.0887	10.20	13.79	3.59	50.22	10:27
2	TOC	0.2366	2.3657	10.39	13.99	3.60	50.18	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1910796-004.01	0.2410 ppm	0.0085 ppm	3.5400%	2019/11/23 20:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2349	2.3495	10.38	14.07	3.70	50.17	10:30
2	TOC	0.2470	2.4703	10.46	14.10	3.64	50.21	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1910796-004.01 ms	22.5196 ppm	0.0000 ppm	0.0000%	2019/11/23 20:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	22.5196	225.1962	161.65	165.26	3.61	50.18	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.6507 ppm (PASS)	0.0000 ppm	0%	2019/11/23 21:01

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6507	246.5070	176.79	180.47	3.68	50.17	10:32

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 8

	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%	2019/11/23 21:15

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.20	10.96	3.76	50.20	10:30

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1910796-001.01	1.1291 ppm	0.0626 ppm	5.5400%	2019/11/23 21:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0848	10.8484	16.15	19.70	3.56	50.19	10:28
2	TOC	1.1734	11.7338	16.75	20.53	3.78	50.20	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1910796-002.01	0.8600 ppm	0.0811 ppm	9.4400%	2019/11/23 21:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9173	9.1734	15.01	18.72	3.71	50.17	10:29

2	TOC	0.8026	8.0257	14.23	17.85	3.62	50.21	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1910796-003.01	1.8026 ppm	0.0160 ppm	0.8900%	2019/11/23 22:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.8139	18.1393	21.10	24.61	3.52	50.15	10:27
2	TOC	1.7912	17.9124	20.94	24.64	3.70	50.17	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1910847-001.01 20x	33.9319 ppm	0.1646 ppm	0.4900%	2019/11/23 22:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	34.0483	340.4830	239.90	243.51	3.61	50.13	10:25
2	TOC	33.8155	338.1553	238.32	242.06	3.74	50.17	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1910847-002.01	32.6696 ppm	0.2662 ppm	0.8100%	2019/11/23 23:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	32.8578	328.5780	231.82	235.44	3.62	50.13	10:29
2	TOC	32.4814	324.8140	229.27	232.83	3.57	50.16	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	K1910847-003.01	35.0515 ppm	0.3546 ppm	1.0100%	2019/11/23 23:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	35.3023	353.0229	248.41	251.92	3.51	50.15	10:24
2	TOC	34.8008	348.0081	245.01	248.71	3.70	50.19	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	16	TOC	K1910847-004.01	61.1285 ppm	0.2557 ppm	0.4200%	2019/11/24 00:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	61.3093	613.0929	424.95	428.74	3.79	50.16	10:26
2	TOC	60.9476	609.4762	422.49	426.28	3.78	50.18	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	17	TOC	K1910861-001.01 100x	7.0368 ppm	0.3612 ppm	5.1300%	2019/11/24 00:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.2922	72.9217	58.28	62.10	3.82	50.15	10:27
2	TOC	6.7814	67.8141	54.82	58.35	3.54	50.11	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1910861-002.01 100x	5.9322 ppm	0.1137 ppm	1.9200%	2019/11/24 01:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	6.0125	60.1255	49.60	53.26	3.66	50.14	10:29
2	TOC	5.8518	58.5182	48.51	52.12	3.61	50.05	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1910861-003.01 100x	5.9661 ppm	0.0454 ppm	0.7600%	2019/11/24 01:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.9983	59.9826	49.50	53.04	3.54	50.09	10:26
2	TOC	5.9340	59.3403	49.06	52.60	3.54	50.03	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.5922 ppm (PASS)	0.0000 ppm	0%	2019/11/24 02:11

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Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5922	245.9222	176.39	179.84	3.44	50.03	10:32

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 8

	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)	0.0310 ppm (PASS)	0.0000 ppm	0%	2019/11/24 02:26

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0310	0.3101	9.67	13.33	3.66	50.08	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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/24 02:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	8.75	12.48	3.72	49.99	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 8

	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)	25.1233 ppm (PASS)	0.0000 ppm	0%	2019/11/24 02:55

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	25.1233	251.2331	180.00	183.53	3.53	50.03	10:32

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

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Sample Type: Sample From Schedule Version 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1910861-004.01 100x	7.8099 ppm	0.0129 ppm	0.1700%	2019/11/24 03:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.8190	78.1899	61.86	65.43	3.57	50.08	10:27
2	TOC	7.8007	78.0072	61.74	65.35	3.62	50.02	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1910861-005.01 100x	7.4694 ppm	0.0388 ppm	0.5200%	2019/11/24 03:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.4968	74.9680	59.67	63.39	3.72	50.08	10:26
2	TOC	7.4420	74.4200	59.30	62.89	3.59	50.04	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1910861-006.01 100x	10.7216 ppm	0.0985 ppm	0.9200%	2019/11/24 04:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	10.7913	107.9132	82.04	85.66	3.63	50.12	10:29
2	TOC	10.6520	106.5195	81.09	84.72	3.63	50.06	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	K1910861-007.01 100x	8.2889 ppm	0.1349 ppm	1.6300%	2019/11/24 04:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	8.3843	83.8426	65.70	69.24	3.54	50.09	10:26
2	TOC	8.1935	81.9348	64.40	67.94	3.54	50.10	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1910929-001.01	1.4775 ppm	0.0693 ppm	4.6900%	2019/11/24 05:02

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Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5265	15.2651	19.15	22.67	3.52	50.08	10:26
2	TOC	1.4285	14.2854	18.48	22.07	3.59	50.12	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	K1910929-002.01	0.8728 ppm	0.0649 ppm	7.4400%	2019/11/24 05:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8269	8.2688	14.40	17.92	3.52	50.11	10:29
2	TOC	0.9187	9.1866	15.02	18.57	3.55	50.11	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	K1910929-003.01	1.9595 ppm	0.0231 ppm	1.1800%	2019/11/24 05:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.9431	19.4313	21.97	25.45	3.48	50.14	10:29
2	TOC	1.9758	19.7583	22.20	25.88	3.69	50.11	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1910969-002.01	1.1736 ppm	0.0380 ppm	3.2400%	2019/11/24 06:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2005	12.0049	16.93	20.49	3.56	50.15	10:28
2	TOC	1.1467	11.4671	16.57	20.16	3.59	50.15	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.2594 ppm (PASS)	0.0000 ppm	0%	2019/11/24 06:54

Pos	Base Analysis	ID	Rep	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run

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	Type		#							Time
B	TOC	25 ppm	1	24.2594	242.5942	174.13	177.81	3.67	50.11	10:29

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 8

	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%	2019/11/24 07:09

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.62	11.38	3.76	50.13	10:30

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1911033-001.03	3.6897 ppm	0.0082 ppm	0.2200%	2019/11/24 07:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.6955	36.9550	33.87	37.44	3.58	50.10	10:30
2	TOC	3.6839	36.8386	33.79	37.44	3.65	50.12	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	K1911033-002.03	2.8101 ppm	0.0494 ppm	1.7600%	2019/11/24 07:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8450	28.4502	28.10	31.78	3.68	50.13	10:24
2	TOC	2.7752	27.7519	27.62	31.38	3.76	50.10	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1911033-003.03	2.8154 ppm	0.0290 ppm	1.0300%	2019/11/24 08:20

Rep	Base			Adjusted		Baseline	Pressure	Run

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#	Analysis Type	ppm	µg	(Abs)	NDIR (Abs)	(Abs)	(psig)	Time
1	TOC	2.8359	28.3589	28.03	31.72	3.68	50.10	10:27
2	TOC	2.7949	27.9493	27.76	31.45	3.69	50.12	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	K1911033-004.03	2.3843 ppm	0.0527 ppm	2.2100%	2019/11/24 08:48

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.4216	24.2162	25.22	28.84	3.62	50.11	10:29
2	TOC	2.3471	23.4708	24.72	28.28	3.57	50.10	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	33	TOC	K1911033-005.03 20x	39.2024 ppm	0.5662 ppm	1.4400%	2019/11/24 09:16

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	39.6027	396.0271	277.60	281.33	3.73	50.11	10:27
2	TOC	38.8020	388.0202	272.17	276.09	3.92	50.14	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	34	TOC	K1911033-006.03	3.8114 ppm	0.8350 ppm	21.9100%	2019/11/24 09:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.4019	44.0190	38.66	42.53	3.86	50.11	10:29
2	TOC	3.2210	32.2098	30.65	34.21	3.56	50.10	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	35	TOC	K1911033-007.03	2.4078 ppm	0.1907 ppm	7.9200%	2019/11/24 10:12

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.5427	25.4272	26.04	29.72	3.67	50.12	10:29
2	TOC	2.2730	22.7298	24.21	27.75	3.54	50.10	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	7.8608	78.6083	62.14	65.77	3.63	50.14	10:31
2	TOC	8.0441	80.4409	63.39	67.04	3.65	50.09	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	37	TOC	K1911033-009.08	3.8094 ppm	0.2302 ppm	6.0400%	2019/11/24 11:09

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.9722	39.7217	35.75	39.38	3.63	50.12	10:30
2	TOC	3.6466	36.4659	33.54	37.02	3.49	50.11	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	38	TOC	K1911033-009.08 ms 2x	26.1443 ppm	0.0000 ppm	0.0000%	2019/11/24 11:37

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.1443	261.4428	186.25	189.80	3.55	50.11	10:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.7622 ppm (PASS)	0.0000 ppm	0%	2019/11/24 11:51

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.7622	247.6222	177.55	181.02	3.47	50.15	10:28

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 8

	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)	0.2695 ppm (PASS)	0.0000 ppm	0%	2019/11/24 12:06

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.2695	2.6952	11.29	14.85	3.56	50.13	10:34

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	39	TOC	MB3	0.1773 ppm	0.0000 ppm	0.0000%	2019/11/24 12:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1773	1.7735	9.99	13.72	3.73	50.13	10:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 8

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	25.0000	1:1	[TOC] LCS [25.0 ppm]	0 / infinity (NA / NA)	24.9621 ppm (PASS)	0.0000 ppm	0%	2019/11/24 12:36

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	24.9621	249.6214	178.90	182.70	3.80	50.17	10:37

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	40	TOC	K1911031-001.01	0.8797 ppm	0.0764 ppm	8.6800%	2019/11/24 12:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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1	TOC	0.9337	9.3369	15.12	18.87	3.75	50.14	10:29
2	TOC	0.8257	8.2570	14.39	18.18	3.79	50.17	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	41	TOC	K1911032-001.01	1.5194 ppm	0.0864 ppm	5.6800%	2019/11/24 13:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5804	15.8042	19.51	23.29	3.78	50.19	10:28
2	TOC	1.4583	14.5830	18.68	22.26	3.58	50.20	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	42	TOC	K1911032-002.01	1.6117 ppm	0.0371 ppm	2.3000%	2019/11/24 13:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5854	15.8543	19.55	22.98	3.44	50.25	10:28
2	TOC	1.6379	16.3788	19.90	23.42	3.52	50.20	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	43	TOC	K1911032-003.01	1.5818 ppm	0.0584 ppm	3.6900%	2019/11/24 14:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.6231	16.2315	19.80	23.26	3.46	50.22	10:25
2	TOC	1.5405	15.4050	19.24	22.79	3.54	50.25	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	44	TOC	K1911032-004.01	1.9794 ppm	0.1074 ppm	5.4300%	2019/11/24 14:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0554	20.5538	22.74	26.37	3.63	50.21	10:30
2	TOC	1.9035	19.0350	21.70	25.32	3.61	50.22	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	45	TOC	K1911032-005.01 400x	4.7687 ppm	0.1385 ppm	2.9100%	2019/11/24 15:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.6708	46.7076	40.49	43.95	3.46	50.26	10:28
2	TOC	4.8667	48.6669	41.82	45.56	3.74	50.27	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	46	TOC	K1911032-006.01	1.9445 ppm	0.1188 ppm	6.1100%	2019/11/24 15:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0284	20.2842	22.55	26.14	3.58	50.27	10:31
2	TOC	1.8605	18.6048	21.41	25.06	3.65	50.23	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	47	TOC	K1911032-007.03 ms 2x	26.3874 ppm	0.0000 ppm	0.0000%	2019/11/24 16:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.3874	263.8736	187.90	191.52	3.62	50.24	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.3561 ppm (PASS)	0.0000 ppm	0%	2019/11/24 16:22

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.3561	243.5606	174.79	178.42	3.63	50.26	10:33

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 8

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	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:1	[TOC] CCB [0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2019/11/24 16:36

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.48	11.05	3.57	50.24	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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	48	TOC	K1911032-007.03	4.1677 ppm	0.0667 ppm	1.6000%	2019/11/24 16:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.1205	41.2052	36.75	40.48	3.73	50.22	10:28
2	TOC	4.2148	42.1480	37.39	40.98	3.59	50.25	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	49	TOC	K1910803-001.01	44.1588 ppm	0.9849 ppm	2.2300%	2019/11/24 17:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	43.4623	434.6235	303.80	307.50	3.70	50.24	10:26
2	TOC	44.8553	448.5526	313.26	317.05	3.79	50.20	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	50	TOC	K1910803-002.01	121.0609 ppm	1.4739 ppm	1.2200%	2019/11/24 17:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	120.0187	1200.1870	823.46	827.29	3.83	50.25	10:28
2	TOC	122.1031	1221.0313	837.61	842.19	4.58	50.24	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	51	TOC	K1910803-003.01	20.0133 ppm	2.5636 ppm	12.8100%	2019/11/24 18:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	21.8260	218.2603	156.94	161.38	4.44	50.17	10:27
2	TOC	18.2005	182.0049	132.33	136.43	4.11	50.22	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	52	TOC	K1910803-004.01	68.5161 ppm	1.6462 ppm	2.4000%	2019/11/24 18:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	67.3521	673.5207	465.97	469.89	3.93	50.19	10:27
2	TOC	69.6802	696.8016	481.77	488.04	6.27	50.15	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	53	TOC	K1910803-005.01	31.2983 ppm	12.2840 ppm	39.2500%	2019/11/24 19:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	39.9844	399.8441	280.20	285.79	5.59	50.18	10:30
2	TOC	22.6123	226.1228	162.27	166.53	4.26	50.14	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	54	TOC	K1910803-006.01	14.3445 ppm	0.8810 ppm	6.1400%	2019/11/24 19:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	14.9674	149.6740	110.38	114.24	3.86	50.18	10:28
2	TOC	13.7215	137.2151	101.92	105.81	3.89	50.14	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	55	TOC	K1911047-001.01 100x	3.3581 ppm	0.4125 ppm	12.2800%	2019/11/24 20:08

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.6498	36.4983	33.56	37.32	3.76	50.14	10:27
2	TOC	3.0664	30.6644	29.60	33.16	3.56	50.17	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	56	TOC	K1911047-002.01 100x	26.8358 ppm	0.0527 ppm	0.2000%	2019/11/24 20:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.8731	268.7307	191.20	194.84	3.64	50.13	10:25
2	TOC	26.7985	267.9853	190.69	194.42	3.73	50.17	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	57	TOC	K1911049-001.01 20x	4.1392 ppm	0.1555 ppm	3.7600%	2019/11/24 21:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.2491	42.4913	37.63	41.27	3.65	50.16	10:28
2	TOC	4.0292	40.2918	36.13	39.75	3.61	50.12	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.6687 ppm (PASS)	0.0000 ppm	0%	2019/11/24 21:32

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6687	246.6868	176.91	180.57	3.66	50.17	10:34

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 8

	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%	2019/11/24 21:47

Pos	Base Analysis	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

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	Type									
D	TOC	0 ppm	1	0.0000	0.0000	8.80	12.38	3.58	50.14	10:32

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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	58	TOC	MB4	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/24 22:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	8.03	11.47	3.43	50.10	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 8

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	25.0000	1:1	[TOC] LCS [25.0 ppm]	0 / infinity (NA / NA)	24.7141 ppm (PASS)	0.0000 ppm	0%	2019/11/24 22:16

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	24.7141	247.1405	177.22	180.81	3.59	50.14	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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	59	TOC	K1911049-002.01 20x	9.0455 ppm	0.0478 ppm	0.5300%	2019/11/24 22:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.0793	90.7931	70.41	74.08	3.66	50.15	10:27
2	TOC	9.0117	90.1169	69.96	73.45	3.50	50.14	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	60	TOC	K1911049-002.01 ms 100x	29.0715 ppm	0.0000 ppm	0.0000%	2019/11/24 22:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	29.0715	290.7153	206.12	209.76	3.64	50.16	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	61	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/24 23:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	7.92	11.64	3.72	50.14	10:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	62	TOC	K1911049-003.01	11.8161 ppm	0.0456 ppm	0.3900%	2019/11/24 23:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	11.7838	117.8381	88.77	92.40	3.62	50.11	10:31
2	TOC	11.8483	118.4834	89.21	92.81	3.60	50.16	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	63	TOC	K1911049-004.01	1.5999 ppm	0.0839 ppm	5.2400%	2019/11/24 23:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.6592	16.5924	20.05	23.59	3.54	50.11	10:30
2	TOC	1.5406	15.4065	19.24	22.81	3.57	50.13	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	64	TOC	K1911028-001.04	0.8950 ppm	0.0518 ppm	5.7800%	2019/11/25 00:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9316	9.3163	15.11	18.58	3.47	50.15	10:28
2	TOC	0.8584	8.5841	14.61	18.06	3.45	50.11	10:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC)	CAS_salt_010711	CAS_salt_010711

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(v1323) (v4) (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	65	TOC	K1911028-002.04	21.8501 ppm	0.4095 ppm	1.8700%	2019/11/25 00:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	22.1397	221.3968	159.07	162.59	3.52	50.14	10:29
2	TOC	21.5606	215.6056	155.14	158.84	3.70	50.12	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	66	TOC	K1911028-003.04	0.7336 ppm	0.0533 ppm	7.2700%	2019/11/25 01:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7713	7.7134	14.02	17.61	3.59	50.10	10:26
2	TOC	0.6959	6.9591	13.51	17.14	3.64	50.14	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.2538 ppm (PASS)	0.0000 ppm	0%	2019/11/25 01:49

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.2538	242.5382	174.10	177.84	3.74	50.11	10:29

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 8

	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%	2019/11/25 02:04

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	6.19	9.91	3.72	50.09	10:33

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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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	67	TOC	K1911028-004.04	1.4272 ppm	0.0215 ppm	1.5000%	2019/11/25 02:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4424	14.4239	18.58	22.17	3.60	50.13	10:29
2	TOC	1.4120	14.1204	18.37	22.07	3.70	50.12	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	68	TOC	K1911028-005.04	1.4693 ppm	0.0117 ppm	0.7900%	2019/11/25 02:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4776	14.7759	18.81	22.49	3.68	50.15	10:28
2	TOC	1.4611	14.6110	18.70	22.34	3.64	50.11	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	69	TOC	FB 11/21/19	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/25 03:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.76	9.25	3.49	50.12	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	70	TOC	FB 11/22/19	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/25 03:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.79	9.29	3.50	50.13	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	71	TOC	K1911043-001.01 doc 1000x	11.7513 ppm	0.0120 ppm	0.1000%	2019/11/25 03:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	11.7598	117.5980	88.61	92.27	3.66	50.11	10:29
2	TOC	11.7429	117.4286	88.49	92.16	3.67	50.11	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	72	TOC	K1911043-002.01 doc 1000x	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/25 04:12

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	7.79	11.41	3.62	50.11	10:29
2	TOC	0.0000	0.0000	7.15	10.87	3.72	50.09	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	73	TOC	K1910975-002.01 doc 10x	8.1521 ppm	0.2117 ppm	2.6000%	2019/11/25 04:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	8.0024	80.0240	63.10	66.61	3.51	50.14	10:30
2	TOC	8.3018	83.0176	65.14	68.78	3.64	50.11	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	74	TOC	K1910975-001.01 doc	0.8387 ppm	0.1176 ppm	14.0200%	2019/11/25 05:08

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9219	9.2190	15.04	18.69	3.65	50.11	10:26
2	TOC	0.7556	7.5558	13.91	17.48	3.57	50.12	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	75	TOC	K1910975-001.01 ms doc	26.6131 ppm	0.0000 ppm	0.0000%	2019/11/25 05:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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1	TOC	26.6131	266.1305	189.43	193.03	3.60	50.14	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	61	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/25 05:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	7.23	10.93	3.70	50.12	10:28
2	TOC	0.0000	0.0000	6.73	10.14	3.40	50.11	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7842 (IC) (v1323)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 8

	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)	24.1613 ppm (PASS)	0.0000 ppm	0%	2019/11/25 06:19

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.1613	241.6131	173.47	177.17	3.70	50.11	10:33

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 8

	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%	2019/11/25 06:34

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.86	9.52	3.65	50.12	10:29

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

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1322	1.2997	0.8410	0.0000	0.0000	0.0000	2019/11/21 13:13	Fusion1 (Fusion1)
v1323	1.3397	1.1360	0.0000	0.0000	0.0000	2019/11/23 16:30	Fusion1 (Fusion1)

Calibrations

Name: CAS_salt_010711 (TOC)

Version: v30

Ver Creation: 2019/03/05 17:42

Comment:

Operator: Fusion1 (Fusion1)

Basic Analysis Type: TOC

Calibration curve formula: TOC: y = 6.788x + 9.463

r^2 value: TOC: r^2 = 0.99963

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

Ver Creation: 2019/02/21 17:57

Comment:

Operator: Fusion1 (Fusion1)

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
UVReactorPrerinse	Off	BaselineStabilizeTime	0.70 min
UVReactorPrerinseVolume	5.0	DetectorPressureFlow	150 ml/min
NumberOfUVReactorPrerinses	1	SyringeSpeedWaste	10
ICSpargeTime	1.00 mins	SyringeSpeedAcid	7
DetectorSweepFlow	500 ml/min	SyringeSpeedReagent	7

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PreSpargeTime	2.00 mins
SystemFlow	500 ml/min

SyringeSpeedDIWater	7
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

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	2019/11/25 06:49

ALS Environmental

StarLIMS Run: 661076, 661077, 661078, 661079

Analysis: DOC/TOC

Method: SM 5310 C, 9060A, 415.1, 9060

CCV: 11-GEN-05-82C 50 ppm LCS: 11-GEN-05-79J 25.0 ppm

ICAL Date: 3/6/19

ICAL ID: 11-GEN-05-76H

ICS ID: 11-GEN-05-78M

ICS TV: 25.0 ppm ICS % R < 1

Spike ID: 11-GEN-05-82C 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-83D

21 % H3PO4: 11-GEN-05-83B

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, N11314F, Marge

FILTER ID: 16967789

23 RCP 11/26/19

Analyzed By: RCP	Date Analyzed: 11/26/19
Reviewed By: [signature]	Date Reviewed: 11/26/19

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Work Request # Original ( ) K1910803, 847, 1037, 1050, 1084, 1085, 1096, 963, 1034, 963, 1043

Tier: IV IV II II II IV II II II II II

Date Analyzed: 11/26/19

TOC: 661464 661465

Analyst: BeD

Run # DOC: 661466

Analysis: TOC/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?	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 ≥ 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: K1911037-3/3d report a high %RSD. However, these samples are less than 5x the MRL.

Final Approved by: [signature] Date: 12/2/19

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661464 **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?
K1910803-002	Carbon, Total Organic	N/A		Water	0.90 mg/L	10 ml	180 mg/L	200	20	100			11/26/19 14:26	N
K1910803-003	Carbon, Total Organic	N/A		Water	14.27 mg/L	10 ml	14.3 mg/L	1	0.07	0.50			11/26/19 14:54	N
K1910803-004	Carbon, Total Organic	N/A		Water	13.03 mg/L	10 ml	1300 mg/L	100	7	50			11/26/19 15:22	N
K1910803-005	Carbon, Total Organic	N/A		Water	16.70 mg/L	10 ml	16.7 mg/L	1	0.07	0.50			11/26/19 15:50	N
K1910847-004	Carbon, Total Organic	N/A		Ground Water	3.25 mg/L	10 ml	65 mg/L	20	2	10			11/26/19 13:58	N
K1911037-001	Carbon, Total Organic	N/A		Water	5.79 mg/L	10 ml	5.79 mg/L	1	0.07	0.50			11/26/19 21:43	N
K1911037-002	Carbon, Total Organic	N/A		Water	25.83 mg/L	10 ml	25.8 mg/L	1	0.07	0.50			11/26/19 23:10	N
K1911037-003	Carbon, Total Organic	N/A		Water	0.63 mg/L	10 ml	0.63 mg/L	1	0.07	0.50			11/26/19 23:38	N
K1911050-001	Carbon, Total Organic	N/A		Ground Water	16.22 mg/L	10 ml	16.2 mg/L	1	0.07	0.50			11/27/19 00:06	N
K1911050-005	Carbon, Total Organic	N/A		Ground Water	1.98 mg/L	10 ml	1.98 mg/L	1	0.07	0.50			11/27/19 00:34	N
K1911084-001	Carbon, Total Organic	N/A		Water	0.12 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 19:23	N
K1911084-002	Carbon, Total Organic	N/A		Water	0.18 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 19:51	N
K1911084-003	Carbon, Total Organic	N/A		Water	10.56 mg/L	10 ml	10.6 mg/L	1	0.07	0.50			11/26/19 20:19	N
K1911084-004	Carbon, Total Organic	N/A		Water	0.43 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 20:47	N
K1911084-005	Carbon, Total Organic	N/A		Water	0.14 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 21:15	N
K1911085-001	Carbon, Total Organic	N/A		Ground Water	1.17 mg/L	10 ml	1.17 mg/L	1	0.07	0.50			11/26/19 16:18	N
K1911085-002	Carbon, Total Organic	N/A		Ground Water	1.28 mg/L	10 ml	1.28 mg/L	1	0.07	0.50			11/26/19 17:30	N
K1911085-003	Carbon, Total Organic	N/A		Ground Water	0.73 mg/L	10 ml	0.73 mg/L	1	0.07	0.50			11/26/19 17:58	N
K1911085-004	Carbon, Total Organic	N/A		Ground Water	0.44 mg/L	10 ml	0.44 mg/L J	1	0.07	0.50			11/26/19 18:26	N
K1911096-001	Carbon, Total Organic	N/A		Water	0.79 mg/L	10 ml	0.79 mg/L	1	0.07	0.50			11/26/19 18:54	N
KQ1917720-01	Carbon, Total Organic	CCV		Ground Water	24.38 mg/L	10 ml	24.4 mg/L	1					11/26/19 12:44	N
KQ1917720-02	Carbon, Total Organic	CCV		Ground Water	24.84 mg/L	10 ml	24.8 mg/L	1					11/26/19 17:01	N
KQ1917720-03	Carbon, Total Organic	CCV		Ground Water	24.37 mg/L	10 ml	24.4 mg/L	1					11/26/19 22:11	N
KQ1917720-04	Carbon, Total Organic	CCV		Ground Water	24.59 mg/L	10 ml	24.6 mg/L	1					11/27/19 02:54	N
KQ1917720-05	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 12:59	N
KQ1917720-06	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 17:15	N
KQ1917720-07	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 22:26	N
KQ1917720-08	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/27/19 03:09	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661464 **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?
KQ1917720-09	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 13:13	N
KQ1917720-10	Carbon, Total Organic	LCS		Ground Water	25.01 mg/L	10 ml	25.0 mg/L	1	0.07	0.50	100		11/26/19 13:28	N
KQ1917720-11	Carbon, Total Organic	MS	K1911085-001	Ground Water	27.01 mg/L	10 ml	27.0 mg/L	1	0.07	0.50	103		11/26/19 16:46	N
KQ1917720-12	Carbon, Total Organic	DUP	K1910803-002	Water	0.92 mg/L	10 ml	180 mg/L	200	20	100		3	11/26/19 14:26	N
KQ1917720-13	Carbon, Total Organic	DUP	K1910803-003	Water	15.17 mg/L	10 ml	15.2 mg/L	1	0.07	0.50		6	11/26/19 14:54	N
KQ1917720-14	Carbon, Total Organic	DUP	K1910803-004	Water	12.36 mg/L	10 ml	1240 mg/L	100	7	50		5	11/26/19 15:22	N
KQ1917720-15	Carbon, Total Organic	DUP	K1910803-005	Water	16.52 mg/L	10 ml	16.5 mg/L	1	0.07	0.50		1	11/26/19 15:50	N
KQ1917720-16	Carbon, Total Organic	DUP	K1910847-004	Ground Water	3.24 mg/L	10 mL	65 mg/L	20	2	10		<1	11/26/19 13:58:00	N
KQ1917720-17	Carbon, Total Organic	DUP	K1911037-001	Water	5.88 mg/L	10 ml	5.88 mg/L	1	0.07	0.50		1	11/26/19 21:43	N
KQ1917720-18	Carbon, Total Organic	DUP	K1911037-002	Water	26.23 mg/L	10 ml	26.2 mg/L	1	0.07	0.50		2	11/26/19 23:10	N
KQ1917720-19	Carbon, Total Organic	DUP	K1911037-003	Water	0.41 mg/L	10 ml	0.41 mg/L J	1	0.07	0.50		43*	11/26/19 23:38	N
KQ1917720-20	Carbon, Total Organic	DUP	K1911050-001	Ground Water	16.34 mg/L	10 ml	16.3 mg/L	1	0.07	0.50		<1	11/27/19 00:06	N
KQ1917720-21	Carbon, Total Organic	DUP	K1911050-005	Ground Water	1.94 mg/L	10 ml	1.94 mg/L	1	0.07	0.50		2	11/27/19 00:34	N
KQ1917720-22	Carbon, Total Organic	DUP	K1911085-002	Ground Water	1.21 mg/L	10 ml	1.21 mg/L	1	0.07	0.50		5	11/26/19 17:30	N
KQ1917720-23	Carbon, Total Organic	DUP	K1911085-001	Ground Water	1.26 mg/L	10 ml	1.26 mg/L	1	0.07	0.50		8	11/26/19 16:18	N
KQ1917720-24	Carbon, Total Organic	DUP	K1911085-003	Ground Water	0.71 mg/L	10 ml	0.71 mg/L	1	0.07	0.50		3	11/26/19 17:58	N
KQ1917720-25	Carbon, Total Organic	DUP	K1911085-004	Ground Water	0.42 mg/L	10 ml	0.42 mg/L J	1	0.07	0.50		5	11/26/19 18:26	N
KQ1917720-26	Carbon, Total Organic	DUP	K1911084-001	Water	0.13 mg/L	10 ml	0.13 mg/L J	1	0.07	0.50		NC	11/26/19 19:23	N
KQ1917720-27	Carbon, Total Organic	DUP	K1911084-005	Water	0.06 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/26/19 21:15	N
KQ1917720-28	Carbon, Total Organic	DUP	K1911084-002	Water	0.17 mg/L	10 ml	0.17 mg/L J	1	0.07	0.50		NC	11/26/19 19:51	N
KQ1917720-29	Carbon, Total Organic	DUP	K1911084-003	Water	10.56 mg/L	10 ml	10.6 mg/L	1	0.07	0.50		<1	11/26/19 20:19	N
KQ1917720-30	Carbon, Total Organic	DUP	K1911084-004	Water	0.32 mg/L	10 ml	0.32 mg/L J	1	0.07	0.50		NC	11/26/19 20:47	N
KQ1917720-31	Carbon, Total Organic	DUP	K1911096-001	Water	0.83 mg/L	10 ml	0.83 mg/L	1	0.07	0.50		5	11/26/19 18:54	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661465 **Method/Testcode:** 415.1/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?
K1910963-001	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/27/19 06:12	N
K1911034-001	Carbon, Total Organic	N/A		Water	4.16 mg/L	10 ml	4.16 mg/L	1	0.07	0.50			11/27/19 01:02	N
K1911034-002	Carbon, Total Organic	N/A		Water	5.08 mg/L	10 ml	5.08 mg/L	1	0.07	0.50			11/27/19 01:30	N
K1911034-003	Carbon, Total Organic	N/A		Water	4.26 mg/L	10 ml	4.26 mg/L	1	0.07	0.50			11/27/19 01:58	N
K1911034-004	Carbon, Total Organic	N/A		Water	12.66 mg/L	10 ml	12.7 mg/L	1	0.07	0.50			11/27/19 02:26	N
K1911034-005	Carbon, Total Organic	N/A		Water	2.85 mg/L	10 ml	2.85 mg/L	1	0.07	0.50			11/27/19 03:24	N
K1911034-006	Carbon, Total Organic	N/A		Water	6.47 mg/L	10 ml	6.47 mg/L	1	0.07	0.50			11/27/19 03:52	N
K1911034-007	Carbon, Total Organic	N/A		Water	3.58 mg/L	10 ml	3.58 mg/L	1	0.07	0.50			11/27/19 04:20	N
K1911034-008	Carbon, Total Organic	N/A		Water	4.73 mg/L	10 ml	4.73 mg/L	1	0.07	0.50			11/27/19 04:48	N
K1911034-009	Carbon, Total Organic	N/A		Water	3.59 mg/L	10 ml	3.59 mg/L	1	0.07	0.50			11/27/19 05:16	N
K1911034-010	Carbon, Total Organic	N/A		Water	4.73 mg/L	10 ml	4.73 mg/L	1	0.07	0.50			11/27/19 05:44	N
KQ1917721-01	Carbon, Total Organic	CCV		Water	24.37 mg/L	10 ml	24.4 mg/L	1					11/26/19 22:11	N
KQ1917721-02	Carbon, Total Organic	CCV		Water	24.59 mg/L	10 ml	24.6 mg/L	1					11/27/19 02:54	N
KQ1917721-03	Carbon, Total Organic	CCV		Water	24.12 mg/L	10 ml	24.1 mg/L	1					11/27/19 07:24	N
KQ1917721-04	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 22:26	N
KQ1917721-05	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/27/19 03:09	N
KQ1917721-06	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/27/19 07:38	N
KQ1917721-07	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			11/26/19 22:41	N
KQ1917721-08	Carbon, Total Organic	LCS		Water	24.70 mg/L	10 ml	24.7 mg/L	1	0.07	0.50	99		11/26/19 22:55	N
KQ1917721-09	Carbon, Total Organic	MS	K1910963-001	Water	25.13 mg/L	10 ml	25.1 mg/L	1	0.07	0.50	101		11/27/19 06:40	N
KQ1917721-10	Carbon, Total Organic	DUP	K1910963-001	Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	11/27/19 06:12	N
KQ1917721-11	Carbon, Total Organic	DUP	K1911034-001	Water	4.16 mg/L	10 ml	4.16 mg/L	1	0.07	0.50		<1	11/27/19 01:02	N
KQ1917721-12	Carbon, Total Organic	DUP	K1911034-002	Water	5.09 mg/L	10 ml	5.09 mg/L	1	0.07	0.50		<1	11/27/19 01:30	N
KQ1917721-13	Carbon, Total Organic	DUP	K1911034-003	Water	4.26 mg/L	10 ml	4.26 mg/L	1	0.07	0.50		<1	11/27/19 01:58	N
KQ1917721-14	Carbon, Total Organic	DUP	K1911034-004	Water	12.37 mg/L	10 ml	12.4 mg/L	1	0.07	0.50		2	11/27/19 02:26	N
KQ1917721-15	Carbon, Total Organic	DUP	K1911034-005	Water	2.84 mg/L	10 ml	2.84 mg/L	1	0.07	0.50		<1	11/27/19 03:24	N
KQ1917721-16	Carbon, Total Organic	DUP	K1911034-006	Water	6.43 mg/L	10 ml	6.43 mg/L	1	0.07	0.50		<1	11/27/19 03:52	N
KQ1917721-17	Carbon, Total Organic	DUP	K1911034-007	Water	3.62 mg/L	10 ml	3.62 mg/L	1	0.07	0.50		1	11/27/19 04:20	N
KQ1917721-18	Carbon, Total Organic	DUP	K1911034-008	Water	4.76 mg/L	10 ml	4.76 mg/L	1	0.07	0.50		<1	11/27/19 04:48	N
KQ1917721-19	Carbon, Total Organic	DUP	K1911034-009	Water	3.55 mg/L	10 ml	3.55 mg/L	1	0.07	0.50		1	11/27/19 05:16	N
KQ1917721-20	Carbon, Total Organic	DUP	K1911034-010	Water	4.60 mg/L	10 ml	4.60 mg/L	1	0.07	0.50		3	11/27/19 05:44	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 661466 **Method/Testcode:** 415.1/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?
K1910963-002	Carbon, Dissolved Organic	N/A		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 08:23:00	N
K1911043-002	Carbon, Dissolved Organic (DOC)	N/A		Water	1.70 mg/L	10 mL	1.70 mg/L	1	0.07	0.50			11/27/19 09:20:00	N
KQ1917722-01	Carbon, Dissolved Organic	CCV		Water	24.12 mg/L	10 mL	24.1 mg/L	1					11/27/19 07:24:00	N
KQ1917722-01	Carbon, Dissolved Organic (DOC)	CCV		Water	24.12 mg/L	10 mL	24.1 mg/L	1					11/27/19 07:24:00	N
KQ1917722-02	Carbon, Dissolved Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 07:38:00	N
KQ1917722-02	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 07:38:00	N
KQ1917722-03	Carbon, Dissolved Organic	CCV		Water	24.23 mg/L	10 mL	24.2 mg/L	1					11/27/19 10:17:00	N
KQ1917722-03	Carbon, Dissolved Organic (DOC)	CCV		Water	24.23 mg/L	10 mL	24.2 mg/L	1					11/27/19 10:17:00	N
KQ1917722-04	Carbon, Dissolved Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 10:31:00	N
KQ1917722-04	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 10:31:00	N
KQ1917722-05	Carbon, Dissolved Organic	MB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 07:53:00	N
KQ1917722-05	Carbon, Dissolved Organic (DOC)	MB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 07:53:00	N
KQ1917722-06	Carbon, Dissolved Organic	LCS		Water	24.76 mg/L	10 mL	24.8 mg/L	1	0.07	0.50	99		11/27/19 08:08:00	N
KQ1917722-06	Carbon, Dissolved Organic (DOC)	LCS		Water	24.76 mg/L	10 mL	24.8 mg/L	1	0.07	0.50	99		11/27/19 08:08:00	N
KQ1917722-07	Carbon, Dissolved Organic	MS	K1910963-002	Water	25.49 mg/L	10 mL	25.5 mg/L	1	0.07	0.50	102		11/27/19 08:51:00	N
KQ1917722-08	Carbon, Dissolved Organic	DUP	K1910963-002	Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50		NC	11/27/19 08:23:00	N
KQ1917722-09	Carbon, Dissolved Organic (DOC)	DUP	K1911043-002	Water	1.75 mg/L	10 mL	1.75 mg/L	1	0.07	0.50		3	11/27/19 09:20:00	N
KQ1917722-10	Carbon, Dissolved Organic (DOC)	N/A		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			11/27/19 08:23:00	N
KQ1917722-11	Carbon, Dissolved Organic (DOC)	DUP	KQ1917722-10	Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50		NC	11/27/19 08:23:00	N
KQ1917722-12	Carbon, Dissolved Organic (DOC)	MS	KQ1917722-10	Water	25.49 mg/L	10 mL	25.5 mg/L	1	0.07	0.50	102		11/27/19 08:51:00	N

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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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	ccv	1	24.383	0.0000	24.3827	24.3827	24.4	11/26/2019
3	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
4	mb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
5	lcs	1	25.010	0.0000	25.0096	25.0096	25.0	11/26/2019
6	K1910847-004	20	3.251	0.0000	3.2507	65.014	65.01	11/26/2019
7	K1910847-004	20	3.241	0.0000	3.2405	64.81	64.8	11/26/2019
8	K1910803-002	200	0.898	0.0000	0.8975	179.5	180	11/26/2019
9	K1910803-002	200	0.925	0.0000	0.9249	184.98	184.98	11/26/2019
10	K1910803-003	1	14.267	0.0000	14.2670	14.267	14.27	11/26/2019
11	K1910803-003	1	15.165	0.0000	15.1650	15.165	15.2	11/26/2019
12	K1910803-004	100	13.033	0.0000	13.0326	1303.26	1303.26	11/26/2019
13	K1910803-004	100	12.361	0.0000	12.3610	1236.1	1236.10	11/26/2019
14	K1910803-005	1	16.696	0.0000	16.6964	16.6964	16.70	11/26/2019
15	K1910803-005	1	16.522	0.0000	16.5216	16.5216	16.5	11/26/2019
16	K1911085-001	1	1.165	0.0000	1.1654	1.1654	1.2	11/26/2019
17	K1911085-001	1	1.261	0.0000	1.2605	1.2605	1.26	11/26/2019
18	KQ1917720-11	1	27.011	0.0000	27.0105	27.0105	27.0	11/26/2019
19	ccv	1	24.839	0.0000	24.8385	24.8385	24.8	11/26/2019
20	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
21	K1911085-002	1	1.276	0.0000	1.2760	1.276	1.28	11/26/2019
22	K1911085-002	1	1.208	0.0000	1.2081	1.2081	1.2	11/26/2019
23	K1911085-003	1	0.733	0.0000	0.7327	0.7327	0.7	11/26/2019
24	K1911085-003	1	0.715	0.0000	0.7146	0.7146	0.71	11/26/2019
25	K1911085-004	1	0.442	0.0000	0.4422	0.4422	<0.5	11/26/2019

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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By: BCP	Date Analyzed	11/26/19	
Reviewed By:	Date Reviewed	12/2/19	

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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	K1911085-004	1	0.421	0.0000	0.4205	0.4205	<0.5	11/26/2019
27	K1911096-001	1	0.788	0.0000	0.7884	0.7884	0.79	11/26/2019
28	K1911096-001	1	0.831	0.0000	0.8314	0.8314	0.8	11/26/2019
29	K1911084-001	1	0.122	0.0000	0.1219	0.1219	<0.5	11/26/2019
30	K1911084-001	1	0.126	0.0000	0.1262	0.1262	<0.5	11/26/2019
31	K1911084-002	1	0.175	0.0000	0.1751	0.1751	<0.5	11/26/2019
32	K1911084-002	1	0.172	0.0000	0.1718	0.1718	<0.5	11/26/2019
33	K1911084-003	1	10.564	0.0000	10.5636	10.5636	10.6	11/26/2019
34	K1911084-003	1	10.562	0.0000	10.5616	10.5616	10.6	11/26/2019
35	K1911084-004	1	0.431	0.0000	0.4313	0.4313	<0.5	11/26/2019
36	K1911084-004	1	0.316	0.0000	0.3155	0.3155	<0.5	11/26/2019
37	K1911084-005	1	0.144	0.0000	0.1438	0.1438	<0.5	11/26/2019
38	K1911084-005	1	0.059	0.0000	0.0587	0.0587	<0.5	11/26/2019
39	K1911037-001	1	5.794	0.0000	5.7939	5.7939	5.8	11/26/2019
40	K1911037-001	1	5.877	0.0000	5.8773	5.8773	5.9	11/26/2019
41	ccv	1	24.373	0.0000	24.3729	24.3729	24.4	11/26/2019
42	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
43	K1911037-002	1	25.829	0.0000	25.8285	25.8285	25.8	11/26/2019
44	K1911037-002	1	26.233	0.0000	26.2334	26.2334	26.2	11/26/2019
45	K1911037-003	1	0.631	0.0000	0.6306	0.6306	0.6	11/26/2019
46	K1911037-003	1	0.406	0.0000	0.4058	0.4058	<0.5	11/26/2019
47	K1911050-001	1	16.222	0.0000	16.2221	16.2221	16.2	11/27/2019
48	K1911050-001	1	16.339	0.0000	16.3389	16.3389	16.3	11/27/2019
49	K1911050-005	1	1.977	0.0000	1.9767	1.9767	2.0	11/27/2019
50	K1911050-005	1	1.935	0.0000	1.9351	1.9351	1.9	11/27/2019

Analyzed By: BCD	Date Analyzed 11/26/19
Reviewed By:	Date Reviewed 12/2/19

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	
51	ccv	1	24.586	0.0000	24.5857	24.5857	24.59	11/27/2019
52	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
53		1		0.0000	0.0000	0	<0.5	
54		1		0.0000	0.0000	0	<0.5	
55		1		0.0000	0.0000	0	<0.5	
56		1		0.0000	0.0000	0	<0.5	
57		1		0.0000	0.0000	0	<0.5	
58		1		0.0000	0.0000	0	<0.5	
59		1		0.0000	0.0000	0	<0.5	
60		1		0.0000	0.0000	0	<0.5	
61		1		0.0000	0.0000	0	<0.5	
62		1		0.0000	0.0000	0	<0.5	
63		1		0.0000	0.0000	0	<0.5	
64		1		0.0000	0.0000	0	<0.5	
65		1		0.0000	0.0000	0	<0.5	
66		1		0.0000	0.0000	0	<0.5	
67		1		0.0000	0.0000	0	<0.5	
68		1		0.0000	0.0000	0	<0.5	
69		1		0.0000	0.0000	0	<0.5	
70		1		0.0000	0.0000	0	<0.5	
71		1		0.0000	0.0000	0	<0.5	
72		1		0.0000	0.0000	0	<0.5	
73		1		0.0000	0.0000	0	<0.5	
74		1		0.0000	0.0000	0	<0.5	
75		1		0.0000	0.0000	0	<0.5	

Analyzed By: KCP	Date Analyzed 11/26/19
Reviewed By: JC	Date Reviewed 12/2/19

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	ccv	1	24.373	0.0000	24.3729	24.3729	24.4	11/26/2019
3	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
4	mb	1	0.000	0.0000	0.0000	0	<0.5	11/26/2019
5	lcs	1	24.702	0.0000	24.7023	24.7023	24.7	11/26/2019
6	K1911034-001	1	4.162	0.0000	4.1616	4.1616	4.16	11/27/2019
7	K1911034-001	1	4.162	0.0000	4.1619	4.1619	4.2	11/27/2019
8	K1911034-002	1	5.084	0.0000	5.0839	5.0839	5	11/27/2019
9	K1911034-002	1	5.087	0.0000	5.0872	5.0872	5.09	11/27/2019
10	K1911034-003	1	4.263	0.0000	4.2629	4.2629	4.26	11/27/2019
11	K1911034-003	1	4.258	0.0000	4.2581	4.2581	4.3	11/27/2019
12	K1911034-004	1	12.665	0.0000	12.6646	12.6646	12.66	11/27/2019
13	K1911034-004	1	12.375	0.0000	12.3749	12.3749	12.37	11/27/2019
14	ccv	1	24.586	0.0000	24.5857	24.5857	24.59	11/27/2019
15	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
16	K1911034-005	1	2.851	0.0000	2.8509	2.8509	2.9	11/27/2019
17	K1911034-005	1	2.841	0.0000	2.8414	2.8414	2.84	11/27/2019
18	K1911034-006	1	6.468	0.0000	6.4677	6.4677	6.5	11/27/2019
19	K1911034-006	1	6.427	0.0000	6.4268	6.4268	6.4	11/27/2019
20	K1911034-007	1	3.577	0.0000	3.5774	3.5774	3.58	11/27/2019
21	K1911034-007	1	3.619	0.0000	3.6185	3.6185	3.62	11/27/2019
22	K1911034-008	1	4.732	0.0000	4.7321	4.7321	4.7	11/27/2019
23	K1911034-008	1	4.765	0.0000	4.7648	4.7648	4.8	11/27/2019
24	K1911034-009	1	3.591	0.0000	3.5914	3.5914	3.59	11/27/2019
25	K1911034-009	1	3.548	0.0000	3.5484	3.5484	3.55	11/27/2019

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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

	date	time
Analyzed By: BCD	Date Analyzed 11/26/19	
Reviewed By:	Date Reviewed 12/2/19	

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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	K1911034-010	1	4.735	0.0000	4.7348	4.7348	4.73	11/27/2019
27	K1911034-010	1	4.602	0.0000	4.6022	4.6022	4.60	11/27/2019
28	K1910963-001	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
29	K1910963-001	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
30	KQ1917721-09	1	25.134	0.0000	25.1340	25.134	25.1	11/27/2019
31	ccv	1	24.121	0.0000	24.1211	24.1211	24.1	11/27/2019
32	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
33		1		0.0000	0.0000	0	<0.5	
34		1		0.0000	0.0000	0	<0.5	
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:	Date Analyzed 11/26/19
Reviewed By:	Date Reviewed 12/2/19

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	ccv	1	24.121	0.0000	24.1211	24.1211	24.1	11/27/2019
3	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
4	mb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
5	lcs	1	24.756	0.0000	24.7562	24.7562	24.8	11/27/2019
6	K1910963-002	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
7	K1910963-002	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
8	K1910963-002 ms	1	25.491	0.0000	25.4906	25.4906	25	11/27/2019
9	K1911043-002	50	1.697	0.0000	1.6970	84.85	84.85	11/27/2019
10	K1911043-002	50	1.748	0.0000	1.7483	87.415	87.42	11/27/2019
11	ccv	1	24.234	0.0000	24.2344	24.2344	24.2	11/27/2019
12	ccb	1	0.000	0.0000	0.0000	0	<0.5	11/27/2019
13		1		0.0000	0.0000	0	<0.5	
14		1		0.0000	0.0000	0	<0.5	
15		1		0.0000	0.0000	0	<0.5	
16		1		0.0000	0.0000	0	<0.5	
17		1		0.0000	0.0000	0	<0.5	
18		1		0.0000	0.0000	0	<0.5	
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 ----> 10.0 ml =25.0 ppm x Dilution Factor (Ref.# 11-GEN-05-51M)

		date	time
Analyzed By:		Date Analyzed	11/26/19
Reviewed By:		Date Reviewed	12/2/19

Revision 1, 2010 R:\WET\ANALYSES\TOC\TEMPLATE\TOCwaterLIMS

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TOC: 661464, 661465
DOC: 661466

Schedule: 11262019

Version: 5
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2019/11/26 11:38 - 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	K1910847-004.01 20x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
4	Sample	K1910803-002.01 200x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
5	Sample	K1910803-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
6	Sample	K1910803-004.01 100x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
7	Sample	K1910803-005.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
8	Sample	K1911085-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
9	Sample	K1911085-001.01 ms	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
10	Sample	K1911085-002.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
11	Sample	K1911085-003.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
12	Sample	K1911085-004.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
13	Sample	K1911096-001.01	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
14	Sample	K1911084-001.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
15	Sample	K1911084-002.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
16	Sample	K1911084-003.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
17	Sample	K1911084-004.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
18	Sample	K1911084-005.04	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
19	Sample	K1911037-001.02	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	K1911037-002.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
22	Sample	K1911037-003.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
23	Sample	K1911050-001.08	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
24	Sample	K1911050-005.09	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
25	Sample	K1911034-001.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
26	Sample	K1911034-002.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
27	Sample	K1911034-003.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
28	Sample	K1911034-004.02	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
29	Sample	K1911034-005.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
30	Sample	K1911034-006.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
31	Sample	K1911034-007.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
32	Sample	K1911034-008.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
33	Sample	K1911034-009.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
34	Sample	K1911034-010.02	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
35	Sample	K1910963-001.08	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
36	Sample	K1910963-001.08 ms	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
37	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
38	Sample	FB 11/22/19	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

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Schedule: 11262019

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps	Use	State
D	Check Standard	[TOC] CCB [0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
39	Sample	MB3	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
C	Check Standard	[TOC] LCS [25.0 ppm]	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
40	Sample	K1910963-002.10 doc	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
41	Sample	K1910963-002.10 ms doc	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
42	Sample	RB	CAS_salt_010711 (CAS_salt_010711)	1	True	Ready
43	Sample	K1911043-002.01 doc 50x	CAS_salt_010711 (CAS_salt_010711)	2	True	Ready
44	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	

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Fusion Report - 11262019
Tuesday, November 26, 2019 10:48 AM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2019/11/27 12:19 - Wednesday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	11262019	Engine Version:	1.1.5.1
Instrument Name:	Fusion1	Firmware Version:	1.2.0696
Report Version:	1 of 1	Connection:	RS232 COM1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v2) Fusion1 (Fusion1) (v3) Fusion1 (Fusion1) (v4) Fusion1 (Fusion1) (v5)		
Comment:			

Report Results

Sample Type: Clean — From Schedule Version 2

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/26 10:48

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	14.10	17.92	3.82	49.80	05:22
2	TC Clean	10.56	14.21	3.66	50.06	04:02
3	TC Clean	2.88	6.61	3.72	50.11	03:48
4	TC Clean	2.30	5.98	3.68	50.04	03:46

Sample Type: Clean — From Schedule Version 3

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/26 11:10

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.69	15.35	3.66	49.64	05:11
2	TC Clean	4.38	8.07	3.69	50.07	04:02
3	TC Clean	1.75	5.60	3.85	50.06	03:46

4	TC Clean	1.69	5.44	3.75	50.04	03:46

Sample Type: Clean From Schedule Version 4

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2019/11/26 11:33

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.94	15.55	3.61	49.82	05:24
2	TC Clean	4.50	8.40	3.90	50.14	04:02
3	TC Clean	1.90	5.70	3.81	50.15	03:57
4	TC Clean	1.54	5.37	3.83	50.13	03:56

Sample Type: Blank (Creating v1324) From Schedule Version 5

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2019/11/26 11:56

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.95	4.60	3.65	49.63	05:20
2	TC Clean	5.07	8.76	3.70	50.08	04:02
3	TC Clean	2.11	5.67	3.55	50.12	03:49
4	TC Clean	2.00	5.72	3.72	50.10	03:45
5	Reagent Blank	4.00	7.73	3.74	50.16	05:07
6	Acid Blank	1.33	4.87	3.54	49.64	05:27

Sample Type: Sample From Schedule Version 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.3449 ppm	0.0000 ppm	0.0000%	2019/11/26 12:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3449	3.4494	11.12	14.98	3.86	50.33	10:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm

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 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.3827 ppm (PASS)	0.0000 ppm	0%	2019/11/26 12:44

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.3827	243.8273	174.97	178.89	3.92	50.40	10:31

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 5

	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%	2019/11/26 12:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.52	11.31	3.79	50.39	10:33

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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/26 13:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.58	10.65	4.06	50.39	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS

From Schedule Version 5

	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)	25.0096 ppm (PASS)	0.0000 ppm	0%	2019/11/26 13:28

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Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	25.0096	250.0957	179.23	183.05	3.83	50.39	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	2	TOC	ICS	0.5966 ppm	0.0000 ppm	0.0000%	2019/11/26 13:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.5966	5.9656	12.83	16.66	3.83	50.42	10:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	K1910847-004.01 20x	3.2456 ppm	0.0072 ppm	0.2200%	2019/11/26 13:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2507	32.5068	30.85	34.44	3.59	50.32	10:28
2	TOC	3.2405	32.4052	30.78	34.52	3.74	50.36	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1910803-002.01 200x	0.9112 ppm	0.0194 ppm	2.1300%	2019/11/26 14:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8975	8.9754	14.88	18.48	3.60	50.30	10:25
2	TOC	0.9249	9.2494	15.06	18.56	3.50	50.32	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1910803-003.01	14.7160 ppm	0.6350 ppm	4.3200%	2019/11/26 14:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	14.2670	142.6698	105.63	109.34	3.72	50.29	10:27
2	TOC	15.1650	151.6504	111.72	115.38	3.65	50.36	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1910803-004.01 100x	12.6968 ppm	0.4749 ppm	3.7400%	2019/11/26 15:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	13.0326	130.3259	97.25	100.87	3.62	50.25	10:29
2	TOC	12.3610	123.6095	92.69	96.45	3.76	50.27	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	K1910803-005.01	16.6090 ppm	0.1237 ppm	0.7400%	2019/11/26 15:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	16.6964	166.9644	122.12	125.79	3.68	50.24	10:29
2	TOC	16.5216	165.2157	120.93	124.49	3.56	50.25	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1911085-001.01	1.2129 ppm	0.0673 ppm	5.5500%	2019/11/26 16:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.1654	11.6536	16.69	20.36	3.67	50.28	10:31
2	TOC	1.2605	12.6053	17.34	20.94	3.60	50.25	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1911085-001.01 ms	27.0105 ppm	0.0000 ppm	0.0000%	2019/11/26 16:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.0105	270.1046	192.13	195.57	3.44	50.25	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm From Schedule Version 5

			Concentration			Min / Max				

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	Pos	BAT	(ppm)	Dil	Sample ID	(% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.8385 ppm (PASS)	0.0000 ppm	0%	2019/11/26 17:01

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.8385	248.3854	178.06	181.67	3.60	50.28	10:33

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 5

	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%	2019/11/26 17:15

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	7.91	11.57	3.66	50.23	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1911085-002.01	1.2420 ppm	0.0480 ppm	3.8700%	2019/11/26 17:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2760	12.7600	17.44	21.14	3.70	50.29	10:27
2	TOC	1.2081	12.0809	16.98	20.57	3.58	50.24	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1911085-003.01	0.7236 ppm	0.0128 ppm	1.7700%	2019/11/26 17:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7327	7.3269	13.76	17.23	3.47	50.29	10:31
2	TOC	0.7146	7.1457	13.63	17.20	3.56	50.29	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC)	CAS_salt_010711	CAS_salt_010711

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(v1324) (v4) (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1911085-004.01	0.4313 ppm	0.0153 ppm	3.5500%	2019/11/26 18:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4422	4.4217	11.78	15.35	3.56	50.28	10:27
2	TOC	0.4205	4.2051	11.64	15.08	3.44	50.24	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1911096-001.01	0.8099 ppm	0.0304 ppm	3.7600%	2019/11/26 18:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7884	7.8837	14.13	17.80	3.66	50.36	10:27
2	TOC	0.8314	8.3139	14.43	18.14	3.71	50.35	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1911084-001.04	0.1240 ppm	0.0030 ppm	2.4400%	2019/11/26 19:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1219	1.2190	9.61	13.15	3.54	50.37	10:26
2	TOC	0.1262	1.2617	9.64	13.19	3.55	50.38	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	K1911084-002.04	0.1735 ppm	0.0023 ppm	1.3200%	2019/11/26 19:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1751	1.7508	9.97	13.43	3.46	50.37	10:27
2	TOC	0.1718	1.7184	9.95	13.43	3.48	50.37	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	K1911084-003.04	10.5626 ppm	0.0015 ppm	0.0100%	2019/11/26 20:19

Rep	Base	ppm	µg	Adjusted	NDIR (Abs)	Baseline	Pressure	Run

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#	Analysis Type			(Abs)		(Abs)	(psig)	Time
1	TOC	10.5636	105.6365	80.49	84.23	3.74	50.34	10:27
2	TOC	10.5616	105.6159	80.47	84.07	3.59	50.31	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	17	TOC	K1911084-004.04	0.3734 ppm	0.0819 ppm	21.9300%	2019/11/26 20:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4313	4.3127	11.71	15.33	3.62	50.32	10:25
2	TOC	0.3155	3.1548	10.92	14.83	3.91	50.28	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1911084-005.04	0.1013 ppm	0.0602 ppm	59.4500%	2019/11/26 21:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1438	1.4385	9.76	13.29	3.53	50.29	10:31
2	TOC	0.0587	0.5870	9.18	12.97	3.79	50.26	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1911037-001.02	5.8356 ppm	0.0590 ppm	1.0100%	2019/11/26 21:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.7939	57.9387	48.11	51.69	3.57	50.25	10:27
2	TOC	5.8773	58.7725	48.68	52.12	3.45	50.26	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm 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 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.3729 ppm (PASS)	0.0000 ppm	0%	2019/11/26 22:11

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

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B	TOC	25 ppm	1	24.3729	243.7286	174.90	178.54	3.63	50.23	10:33

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 5

	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%	2019/11/26 22:26

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	6.16	9.80	3.64	50.22	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/26 22:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.40	9.08	3.68	50.22	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 5

	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)	24.7023 ppm (PASS)	0.0000 ppm	0%	2019/11/26 22:55

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	24.7023	247.0227	177.14	180.67	3.53	50.21	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1911037-002.02	26.0309 ppm	0.2863 ppm	1.1000%	2019/11/26 23:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.8285	258.2851	184.10	187.69	3.59	50.23	10:26
2	TOC	26.2334	262.3335	186.85	190.55	3.70	50.22	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1911037-003.02	0.5182 ppm	0.1590 ppm	30.6800%	2019/11/26 23:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.6306	6.3059	13.06	16.67	3.61	50.22	10:31
2	TOC	0.4058	4.0578	11.54	15.13	3.59	50.21	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1911050-001.08	16.2805 ppm	0.0826 ppm	0.5100%	2019/11/27 00:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	16.2221	162.2207	118.90	122.49	3.59	50.22	10:30
2	TOC	16.3389	163.3889	119.69	123.24	3.55	50.22	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	K1911050-005.09	1.9559 ppm	0.0294 ppm	1.5000%	2019/11/27 00:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.9767	19.7666	22.20	25.66	3.46	50.20	10:27
2	TOC	1.9351	19.3511	21.92	25.52	3.60	50.19	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1911034-001.02	4.1617 ppm	0.0002 ppm	0.0100%	2019/11/27 01:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

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1	TOC	4.1616	41.6156	37.03	40.51	3.48	50.18	10:27
2	TOC	4.1619	41.6186	37.03	40.56	3.53	50.19	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	K1911034-002.02	5.0856 ppm	0.0023 ppm	0.0500%	2019/11/27 01:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.0839	50.8393	43.29	46.91	3.62	50.22	10:29
2	TOC	5.0872	50.8717	43.31	46.84	3.52	50.20	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	K1911034-003.02	4.2605 ppm	0.0034 ppm	0.0800%	2019/11/27 01:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.2629	42.6292	37.72	41.27	3.55	50.18	10:30
2	TOC	4.2581	42.5806	37.69	41.21	3.53	50.18	10:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1911034-004.02	12.5198 ppm	0.2048 ppm	1.6400%	2019/11/27 02:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	12.6646	126.6458	94.75	98.26	3.51	50.20	10:26
2	TOC	12.3749	123.7495	92.78	96.37	3.58	50.17	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm 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 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.5857 ppm (PASS)	0.0000 ppm	0%	2019/11/27 02:54

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5857	245.8573	176.35	180.01	3.66	50.20	10:33

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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 5

	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%	2019/11/27 03:09

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.59	9.21	3.62	50.20	10:29

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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1911034-005.02	2.8461 ppm	0.0067 ppm	0.2300%	2019/11/27 03:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8509	28.5085	28.13	31.62	3.49	50.18	10:28
2	TOC	2.8414	28.4143	28.07	31.70	3.63	50.17	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	K1911034-006.02	6.4472 ppm	0.0290 ppm	0.4500%	2019/11/27 03:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	6.4677	64.6771	52.68	56.17	3.48	50.19	10:29
2	TOC	6.4268	64.2675	52.41	55.95	3.55	50.21	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1911034-007.02	3.5980 ppm	0.0291 ppm	0.8100%	2019/11/27 04:20

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.5774	35.7744	33.07	36.76	3.69	50.19	10:28

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2	TOC	3.6185	36.1854	33.34	36.91	3.56	50.19	10:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	K1911034-008.02	4.7485 ppm	0.0231 ppm	0.4900%	2019/11/27 04:48

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.7321	47.3213	40.90	44.39	3.48	50.17	10:27
2	TOC	4.7648	47.6484	41.13	44.66	3.53	50.23	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	33	TOC	K1911034-009.02	3.5699 ppm	0.0304 ppm	0.8500%	2019/11/27 05:16

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.5914	35.9143	33.16	36.78	3.62	50.21	10:32
2	TOC	3.5484	35.4841	32.87	36.46	3.59	50.23	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	34	TOC	K1911034-010.02	4.6685 ppm	0.0938 ppm	2.0100%	2019/11/27 05:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.7348	47.3478	40.92	44.47	3.54	50.21	10:31
2	TOC	4.6022	46.0219	40.02	43.57	3.55	50.21	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	35	TOC	K1910963-001.08	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 06:12

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.60	9.13	3.53	50.20	10:27
2	TOC	0.0000	0.0000	5.48	9.09	3.61	50.20	10:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	36	TOC	K1910963-001.08 ms	25.1340 ppm	0.0000 ppm	0.0000%	2019/11/27 06:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.1340	251.3405	179.39	183.06	3.67	50.18	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	37	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 06:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	6.20	9.87	3.67	50.20	10:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	38	TOC	FB 11/22/19	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 07:09

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.41	9.05	3.64	50.19	10:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm 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 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.1211 ppm (PASS)	0.0000 ppm	0%	2019/11/27 07:24

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.1211	241.2109	173.20	176.64	3.44	50.16	10:33

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 5

	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%	2019/11/27 07:38

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Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.36	8.98	3.61	50.19	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	39	TOC	MB3	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 07:53

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	4.44	8.13	3.69	50.14	10:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> LCS From Schedule Version 5

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	25.0000	1:1	[TOC] LCS [25.0 ppm]	0 / infinity (NA / NA)	24.7562 ppm (PASS)	0.0000 ppm	0%	2019/11/27 08:08

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	25.0 ppm	1	24.7562	247.5618	177.51	181.18	3.68	50.13	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 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	40	TOC	K1910963-002.10 doc	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 08:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	7.50	11.12	3.62	50.20	10:29
2	TOC	0.0000	0.0000	7.53	11.19	3.66	50.15	10:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

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	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	41	TOC	K1910963-002.10 ms doc	25.4906 ppm	0.0000 ppm	0.0000%	2019/11/27 08:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.4906	254.9056	181.81	185.37	3.56	50.16	10:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	42	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 09:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.58	9.04	3.47	50.18	10:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	43	TOC	K1911043-002.01 doc 50x	1.7227 ppm	0.0363 ppm	2.1000%	2019/11/27 09:20

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.6970	16.9704	20.30	23.88	3.58	50.17	10:26
2	TOC	1.7483	17.4831	20.65	24.23	3.58	50.23	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	44	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2019/11/27 09:48

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	5.12	8.91	3.79	50.22	10:25
2	TOC	0.0000	0.0000	5.28	8.95	3.67	50.19	10:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 8.7826 (IC) (v1324)	CAS_salt_010711 (v4)	CAS_salt_010711 (v30)

Sample Type: Check Standard --> CCV 25 ppm 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 25 ppm [25 ppm]	0 / infinity (NA / NA)	24.2344 ppm	0.0000 ppm	0%	2019/11/27 10:17

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								(PASS)			

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.2344	242.3438	173.96	177.48	3.52	50.20	10:33

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 5

	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%	2019/11/27 10:31

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0 ppm	1	0.0000	0.0000	5.35	8.99	3.64	50.23	10:30

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

Meta Data Used in this Report

Blanks

Version	Reagent (Abs)	Acid (Abs)	DI IC (Abs)	DI TC (Abs)	DI TOC (Abs)	Save Time	Operator
v1323	1.3397	1.1360	0.0000	0.0000	0.0000	2019/11/23 16:30	Fusion1 (Fusion1)
v1324	1.3317	1.3300	0.0000	0.0000	0.0000	2019/11/26 12:29	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
SampleVolume	10.0 mL
Dilution	1:10
AcidVolume	0.5 ml
ReagentVolume	2.0 ml
UVReactorPrerinse	Off
UVReactorPrerinseVolume	5.0
NumberOfUVReactorPrerinses	1
ICSpargeTime	1.00 mins
DetectorSweepFlow	500 ml/min
PreSpargeTime	2.00 mins
SystemFlow	500 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
ICSpargeRinseVolume	12.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	150 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
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

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	2019/11/27 10:46

ALS Environmental

StarLIMS Run: 661464, 661465, 661466

Analysis: DOC/TOC

Method: SM 5310 C, 9060A, 415.1, 9060

CCV: 11-GEN-05-82C 50 ppm LCS: 11-GEN-05-79J 25.0 ppm

ICAL Date: 3/6/19

ICAL ID: 11-GEN-05-76H

ICS ID: 11-GEN-05-78M

ICS TV: 25.0 ppm ICS % R < 1

Spike ID: 11-GEN-05-82C 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-83D

21 % H3PO4: 11-GEN-05-83E

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F, N11314F, Marge

FILTER ID: 16967789

25 BCP 11/20/19

Analyzed By: BCP	Date Analyzed: 11/20/19
Reviewed By: JC	Date Reviewed: 12/2/19

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • April 2021

Appendix E

Quality Control Summary Report

ACRONYMS AND ABBREVIATIONS

%	percent
%D	percent difference
ALS	ALS Environmental Laboratories
CCB	continuing calibration blank
DQSR	Data Quality Summary Report
DoD	U.S. Department of Defense
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAAP	Longhorn Army Ammunition Plant
LOQ	limit of quantitation
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
QAPP	Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas: Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RARC	*Remedial Action Completion Report*
RPD	relative percent difference
RRF	relative response factor
SDG	sample delivery group
SM	standard method
SOP	standard operating procedure
TOC	total organic carbon
USACE	U.S Army Corps of Engineer
VOC	volatile organic compound

1. DATA QUALITY SUMMARY REPORT

This Data Quality Summary Report (DQSR) describes the findings of the review of data for groundwater sampling activities conducted from January 21, 2019 through November 13, 2019, and is provided to document the quality of the analytical data used in the *Remedial Action Completion Report (RACR), LHAAP-04 Former Pilot Wastewater Treatment Plant, Longhorn Army Ammunition Plant, Karnack Texas*. Sampling procedures and overall quality control (QC) and quality assurance protocols for groundwater sampling are presented in the *Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas (IWWP): Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan (QAPP) (Bhate 2018)*.

This DQSR focuses on the data quality and usability of the samples collected from the following sampling events:

- January 2019 Groundwater Sampling Event
- November 2019 Baseline Groundwater Sampling Event
- November 2019 Post Injection Groundwater Sampling Event

During the period from January 21, 2019 through November 13, 2019, groundwater samples were collected and submitted to the primary laboratory, ALS Environmental Laboratories (ALS) located in Houston, Texas. ALS in Houston performed all analyses in house with the exception of the following:

- Total organic carbon (TOC) analysis was performed by ALS in Kelso, Washington; and
- Perchlorate analysis was conducted by ALS in Salt Lake, Utah.

ALS Laboratories in all three locations are accredited by the U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) Version 5.1 and National Environmental Laboratory Accreditation Program (NELAP) in the State of Texas to perform the analyses throughout the project duration.

Groundwater samples from the sampling events were analyzed for one or more of the following list of parameters:

- Perchlorate – EPA Method 6850
- TOC – Standard Method (SM) 5310C
- Anions (Nitrate and Nitrite as nitrogen and sulfate) – EPA Method 9056A
- Alkalinity – SM 2320B

Specific analyses performed for each sample and for each sampling event are presented on the table included as Attachment E-1. All analytical results from January 21, 2019 through November 13, 2019 sampling activities were received in sample delivery groups (SDGs). Appendix D presents laboratory data packages. Attachment E-1 (provided at the end of this report) summarizes SDG numbers, sample numbers, sample locations, sample collection dates, analysis methods, analysis dates, and laboratories. An APTIM project chemist manually performed EPA Level III data review on 100% of the groundwater sample results. EPA Level III data review was performed in accordance with the guidelines and control criteria specified in the following documents:

- QAPP (Bhate 2018)
- *DoD Quality Systems Manual for Environmental Laboratories, Version 5.1* (DoD 2017)
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (2006), SW-846* (EPA 1996 and updates)
- *Standard Methods for the Examination of Water and Wastewater (21st Edition)* (American Public Health Association et al. 2005)
- *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Superfund Methods Data Review* (EPA 2017)
- *USEPA Contract Laboratory Program*, *National Functional Guidelines for Inorganic Superfund Methods Data Review*, *Final* (EPA 2017)

The following QC elements were included in the EPA Level III data review:

- Sample preservation and sample extraction and analysis holding times
- Laboratory method blanks
- Initial and continuing calibration blanks (anions and TOC analyses only)
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) recoveries
- Matrix spike (MS)/matrix spike duplicate (MSD) recoveries
- Relative percent differences (RPDs)
- Initial calibration and initial calibration verifications (ICVs)
- Continuing calibration verifications (CCVs)
- Field blanks

Analytical data were reviewed in terms of precision, bias, representativeness, comparability, and completeness as follows:

- *Bias* is demonstrated by recovery of target analytes from fortified blank and sample matrices, LCS/LCSD, and MS/MSD, respectively. For organic methods, bias is also demonstrated through recovery of surrogates from each field and QC sample. The recovery of target analytes from fortified samples is compared with the acceptance criteria defined in the QAPP (Bhate, 2018) and DoD Quality Systems Manual (QSM). When the acceptance criteria are not available in the QAPP or DoD QSM, results are compared with the laboratory in-house control limits. When these criteria are not met, the data are qualified accordingly.
- *Precision* is expressed as the RPD between the results of replicate sample analyses: sample duplicates, LCSDs, and MSDs. When analyte RPDs exceed the acceptance criteria, the data are qualified accordingly.
- *Representativeness* of the samples submitted for analysis is ensured by adherence to standard sampling techniques and protocols.
- *Comparability* of sample results is ensured through the use of approved sampling and analysis methods.
- *Completeness* is expressed as a ratio of the number of usable data points to the total number of analytical data results.

The following sections present the EPA Level III data review findings. The discussion summarizes data quality exceedances and their potential impact on the quality and usability of analytical results. Attachment E-2 presents definitions of data qualification. Attachment E-3 summarizes the qualified data.

1.1 Data Quality Outliers

1.1.1 Sample Preservation and Sample Extraction and Analysis Holding Times (Reason Codes 02, 02A and 02B)

The sample coolers and samples contained within were received intact at the laboratory and were held within the required 0 to 6 degrees Celsius, and when required, were chemically preserved in accordance with EPA and SM preservation requirements.

Sample holding times were evaluated by comparing the sample collection dates to the sample extraction and analysis dates. Extraction and analysis holding times were reviewed for all samples to determine the validity of the sample results.

One groundwater sample from monitoring well (04WW05) was collected from the November 2019 baseline groundwater sampling event and submitted to the laboratory for perchlorate, TOC, anions and

alkalinity analyses. All sample containers were received in good condition by the laboratory; however due to laboratory login error, the anions analysis was not logged into the system for analysis. When the oversight was discovered, the 48-hour holding time for nitrate and nitrite as nitrogen was missed. The following table summarizes the affected sample number, analysis, holding time exceedance and holding time requirement:

SDG Number	Analytical Method	Sample Number	Holding Time Outlier (days)	Holding Time Requirement (days)	Data Qualification
HS19110320	EPA9056A	04WW05-191106	Nitrate/Nitrite: 19	2	X

Nitrate and nitrite as nitrogen in the sample was analyzed 19 days after the 48-hour holding time had expired. Because the holding time was grossly exceeded, the non-detected result for nitrate and nitrite as nitrogen in the sample was not usable and was consequently rejected (X). Sulfate in the same sample met the analysis holding time requirement and the sulfate result was not affected and qualified. Except as noted, analysis holding time requirements were achieved for all other samples and for all other analyses.

It should be noted that the sample login oversight was an isolated incidence. The laboratory has since taken corrective actions to ensure that the login errors will not reoccur in the future. Upon sample receipt, the laboratories checked the sample containers against the chain of custody forms and notified APTIM if discrepancies between the sample containers and chain of custody forms were identified. Discrepancies were resolved before the laboratories started analysis. Sample conditions such as cooler temperatures, chemical preservatives, and headspace were documented on the sample receipt form and included in the laboratory data packages. After analysis, department managers reviewed the data to verify that method requirements were followed and target analytes were correctly identified and quantified. Prior to data reporting, the laboratories performed internal QC review to ensure the accuracy and completeness of analytical results.

1.1.2 Laboratory Method Blanks (Reason Code 06A)

The field sample results were evaluated with respect to the laboratory method blank prepared and analyzed for each analytical batch and for each analytical method. All laboratory method blanks were free of perchlorate, TOC, anions, and alkalinity.

1.1.3 Initial and Continuing Calibration Blanks (Reason Code 06B)

In addition to the laboratory method blanks for anions and TOC analyses, initial and continuing calibration blank (CCB) results were reviewed to ensure that the instrument was free of contamination prior to the analysis. All initial and continuing calibration blanks were free of TOC and anions.

1.1.4 Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries and Precisions (Reason Codes 11, 11A, and 11B)

The LCS is an aliquot of analyte-free matrix spiked with target analytes that is prepared with each analytical batch and for each analytical method. The recovery of target analytes from the LCS analysis is a measurement of method performance in an interference-free sample matrix. The review indicated that LCS recoveries and precisions met the established QC requirements for perchlorate, TOC, anions, and alkalinity analyses.

In addition to the LCS analysis, the laboratory performed sample duplicate analysis on project-specific groundwater samples to assess precisions of sample results. The laboratory duplicate analysis was performed for LHAAP-04 samples submitted for TOC analysis. Acceptable precision results were achieved for all laboratory duplicate samples.

1.1.5 Matrix Spike/Matrix Spike Duplicate Recoveries and Precisions (Reason Codes 08, 08A, and 08B)

The MS and MSD samples are a portion of a field sample spiked with target analytes that are prepared with each analytical batch and with each method. The MS/MSD results are used to evaluate any bias introduced to the method due to matrix interference, and to measure bias and precision for each analytical batch.

In accordance with the QAPP requirements (Bhate 2018), the MS/MSD samples are to be collected at a rate of 1 per 20 samples or 5%. During the January and November baseline groundwater sampling events, 5% MS/MSD samples were collected achieving the MS/MSD sample frequency requirement. The following site-specific groundwater samples were spiked for MS/MSD analysis:

SDG Number	Sample Number	Sample Date	MS/MSD Analysis
HS1911045/1902392	LHSMW01-190122	1/22/2019	Perchlorate
HS19110320/1931753	04WW11-191106	11/6/2019	Perchlorate
HS19110320	04WW05-191106	11/6/2019	Nitrate and Nitrite as Nitrogen

The MS bias and precision results met the established QC requirements for perchlorate and nitrate and nitrite as nitrogen analyses for all three spiked samples.

1.1.6 Initial Calibration (Reason Codes 04, 04A, and 04B)

Instrument calibration is performed for perchlorate, TOC, and anions analyses according to the EPA method requirements (EPA 1996). The linear analytical range is established for each method by analysis of calibration standards prepared at increasing concentrations that cover the expected sample concentrations. The acceptability of the initial calibration is determined by calculation of a percent relative standard deviation or coefficient. The initial calibration results were acceptable for all the listed analyses.

Immediately after the initial calibration for each analysis, initial calibration verification was conducted at the mid-point of instrument calibration range by using a second-source calibration standard to verify the accuracy of the initial calibration. The review indicated acceptable initial calibration verification results for perchlorate, TOC and anions analyses.

1.1.7 Continuing Calibration Verification (Reason Codes 05, 05A, and 05B)

Routinely during sample analysis, the stability of the analytical system is monitored by analysis of continuing calibration standards at concentrations near the mid-point of the instrument calibration range. The review indicated that CCVs were conducted at proper frequencies and that the percent difference (%D) values between the relative response factor (RRF) in the initial calibration and the RRF in the continuing calibration met the calibration requirements for perchlorate, TOC and anions analyses.

1.1.8 Trip Blanks (Reason Code 06D)

Trip blanks were prepared by the laboratory and stored with the groundwater samples collected for volatile organic compounds (VOCs) analysis. During January 11, 2019 through November 13, 2019 sampling activities, no groundwater samples were collected for VOC analysis, and therefore no trip blanks were required.

1.1.9 Field Duplicates

In accordance with the QAPP requirements (Bhate 2018), field duplicate samples are to be collected at a minimum rate of 10% of the total number of groundwater samples. Field duplicate samples are evaluated by calculating the RPD between the parent sample and its duplicate. The RPD is calculated using the following equation:

$$RPD = |(S-D)/[(S+D)/2]| \times 100$$

Where:

S = sample result

D = duplicate result

Acceptable precision control criteria are established at less than or equal to 30% for water samples. The RPD is calculated between pairs of field duplicate samples when both results are reported at or above the LOQ.

A total of three field duplicates were collected from the period of January 21, 2019 through November 13, 2019. Field duplicates were collected using the same sampling technique and analyzed for the same analytical parameters as their associated parent samples, Attachment E-4 presents the field duplicate results. As presented on the table, perchlorate was detected above the LOQ in a field duplicate pair (04WW09-190122) from the January 2019 groundwater sampling event. The RPD for the analyte was 9.09% achieving the 30% field precision goal. Field duplicates were also collected from monitoring well (04WW02) from the January and November 2019 baseline groundwater sampling events and analyzed for perchlorate only. Perchlorate was not detected in both pairs and therefore field precisions were not evaluated for the two pairs. Overall, the field duplicate results demonstrated acceptable field sampling and analytical precision for perchlorate analysis.

1.2 Completeness

The following sections present a discussion of technical completeness for the LHAAP-04 groundwater sampling events. Completeness results are calculated for groundwater and field duplicate samples that are used for project decisions. Completeness results are presented in Attachment E-5.

1.2.1 Technical Completeness

Technical completeness is a quantitative measure of the data usability based on the number of rejected data compared to the total number of sample results. The technical completeness goal for each method is

established at equal to or greater than 95%. The technical completeness calculation considers all data that are not rejected to be usable. The technical completeness is calculated as follows:

$$\% \text{ Technical Completeness} = \frac{\text{Number of Usable Results}}{\text{Total Number of Results}} \times 100$$

As discussed in the previous sections, the result of nitrate and nitrite as nitrogen in one sample (04WW05) from the November 2019 baseline groundwater sampling event was rejected (X) due to the holding time exceedance. The data quality and usability of the sulfate result in the same sample however was not affected as the sulfate was analyzed within the holding time requirement. The technical completeness for EPA Method 9056A was 50% and did not meet the 95% technical completeness objective. With the exception of EPA Method 9056A, the technical completeness was 100% for all other methods for the LHAAP-04 groundwater sampling activities, exceeding the 95% technical completeness objective. Therefore, the project data quality objectives were achieved for EPA Method 6850 and Standard Methods 2320 and 5310C for the LHAAP-04 groundwater sampling events.

1.3 Representativeness and Comparability

During sampling, samplers followed the approved QAPP requirements (Bhate 2018) and established sampling SOPs to collect, preserve, document, and ship samples to off-site laboratories, thus ensuring the representativeness of the groundwater samples collected for the sampling events.

Upon sample receipt, the laboratory reviewed sample conditions to ensure that sample containers, preservatives (when applicable), and requested analyses matched the chain-of-custody requirements. Discrepancies between the chain-of-custody forms and sample containers were brought to the attention of the APTIM project chemist and resolved prior to sample analysis.

ALS Laboratories are DoD and NELAP certified and adhered to the most current EPA Methods, QAPP (Bhate 2018), and DoD QSM (DoD 2017) requirements to prepare, analyze, and report the data. This ensures the comparability of the analytical results between different samples and different sampling events. APTIM project chemist performed EPA Level III data validation on 100% of the analytical data obtained from the January 2019 through November 2019 sampling events to verify that the laboratories complied with the DoD QSM, QAPP, and method requirements. Analytical results that were outside the established QC requirements were qualified and the data quality and usability were discussed in the previous sections. Based on a review of the chain-of-custody forms, sample receipt forms, and laboratory data packages, the analytical data reported for LHAAP-04 sampling events has met the comparability requirements.

1.4 Summary

The analytical data has been reviewed for precision, bias, representativeness, comparability, and completeness. With the exception of nitrate and nitrite as nitrogen in one sample, all other QC elements met their respective QC requirements. The result of nitrate and nitrite as nitrogen in one sample was rejected as a result of the holding time exceedance. In order to verify the presence or absence of nitrate and nitrite as nitrogen, it is recommended that monitoring well (04WW05) be re-sampled for nitrate and nitrite as nitrogen during the next sampling event. With the exception of EPA Method 9056A, the 95% technical completeness goal was exceeded for all other methods for all the sampling events. All data except nitrate and nitrite as nitrogen in one sample, are usable for their intended purposes.

REFERENCES

American Public Health Association, American Water Works Association, and Water Environment Federation. 2005. *Standard Methods for the Examination of Water and Wastewater, 21st Edition.* American Public Health Association: Washington, DC.

Bhate 2018. *Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan*.

EPA. 2017. *USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Superfund Methods Data Review,* Office of Superfund Remediation and Technology Innovation, OLEM 9355.0-135 and EPA-540-R-2017-001. January.

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EPA. 1996. *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods (2006), SW-846 On-line*. Office of Solid Waste, Washington D.C. http://www.epa.gov/osw/hazard/testmethods/sw846.

United States Department of Defense (DoD). 2017. *DoD Quality Systems Manual for Environmental Laboratories, Version 5.1.* January.

List of Attachments

Attachment E-1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

Attachment E-2: Data Qualification Flags

Attachment E-3: Qualified Data Summary

Attachment E-4: Summary of Field Duplicate Results

Attachment E-5: Technical Completeness

Attachment E-1: Summary of Sample Collected, Sample Date, Sample Location, and Analysis Method

SDG Number	Task Code	Sample Number	Location ID	Sample Date	Sample Type	Analytical Method	Analysis Date	Lab
1902253	04 JAN 2019	04WW03-190121	04WW03	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	04WW02-190121	04WW02	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	04WW02-190121-FD	04WW02	01/21/2019	FD	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	LHSMW02-190121	LHSMW02	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	04WW04-190121	04WW04	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	04WW05-190121	04WW05	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902253	04 JAN 2019	04WW06-190121	04WW06	01/21/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW11-190122	04WW11	01/22/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW09-190122	04WW09	01/22/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW09-190122-FD	04WW09	01/22/2019	FD	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW10-190122	04WW10	01/22/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	LHSMW01-190122	LHSMW01	01/22/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW07-190122	04WW07	01/22/2019	REG	SW6850	01/28/2019	ALSS
1902392	04 JAN 2019	04WW01-190122	04WW01	01/22/2019	REG	SW6850	01/28/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW02-191105	04WW02	11/05/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW02-191105-FD	04WW02	11/05/2019	FD	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	LHSMW02-191105	LHSMW02	11/05/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW03-191106	04WW03	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW06-191106	04WW06	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW11-191106	04WW11	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW05-191106	04WW05	11/06/2019	REG	SW6850	11/19/2019	ALSS
HS19110320	04 BASELINE NOV 2019	04WW05-191106	04WW05	11/06/2019	REG	SM2320B	11/09/2019	ALSHT
HS19110320	04 BASELINE NOV 2019	04WW05-191106	04WW05	11/06/2019	REG	SW9056	11/27/2019	ALSHT
K1910576	04 BASELINE NOV 2019	04WW05-191106	04WW05	11/06/2019	REG	SM5310C	11/16/2019	ALS
1931753	04 BASELINE NOV 2019	04WW08-191106	04WW08	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	04WW04-191106	04WW04	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	LHSMW01-191106	LHSMW01	11/06/2019	REG	SW6850	11/19/2019	ALSS
1931753	04 BASELINE NOV 2019	FIRE STATION WELL-191106	Fire Station Well	11/06/2019	REG	SW6850	11/19/2019	ALSS
K1910847	04 POST INJ NOV 2019	04WW09-191113-POST-INJ	04WW09	11/13/2019	REG	SM5310C	11/23/2019	ALS
K1910847	04 POST INJ NOV 2019	04WW05-191113-POST-INJ	04WW05	11/13/2019	REG	SM5310C	11/23/2019	ALS
K1910847	04 POST INJ NOV 2019	04WW07-191113-POST-INJ	04WW07	11/13/2019	REG	SM5310C	11/23/2019	ALS
K1910847	04 POST INJ NOV 2019	04WW010-191113-POST-INJ	04WW10	11/13/2019	REG	SM5310C	11/26/2019	ALS

Notes:
SDG - sample delivery group
REG - regular samples shipped to the laboratory
FD - field duplicate samples shipped to the laboratory
ALS/ALSHT/ALSS - ALS Laboratories in Houston, Salt Lake, Kelso

Attachment E-2. Data Qualification Flags

Data Qualifier Definitions for Organic and Inorganic Data Review

Qualifier	Definition
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.
U	The analyte was analyzed for but was not detected above the reported limit of detection.
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated, although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.
J-	The analyte was positively identified; the associated numerical value is its approximate concentration with a low bias in the sample.
J+	The analyte was positively identified; the associated numerical value is its approximate concentration with a high bias in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a “tentative identification.”
NJ	The analysis indicates the presence of an analyte that has been ”tentatively identified,” and the associated value represents its approximate concentration.
UJ	The analyte was not detected above the reported limit of detection. However, the reported limit of detection is approximate and may or may not represent the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.
X	The analyte was analyzed for, but the presence or absence of the analyte has not been verified. Re-sampling and re-analysis may be necessary to confirm or deny the presence of the analyte. Results are rejected, and data are unusable for any purposes.

Attachment E-3: Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
Reason Code 02A		Method SW9056						
04WW05-191106	REG	11/06/2019	Nitrogen	HS19110320	0.5	1.00	mg/L	X

Note:

Please see **Attachment E-2** for definitions of qualifiers

mg/L - milligrams per liter

LOQ - limit of quantitation

REG - regular samples shipped to the laboratory

SDG - sample delivery group

Attachment E-4: Summary of Field Duplicate Results

			Location Code:	04WW02					04WW02				
			Sample Number:	04WW02-190121		04WW02-190121-FD			04WW02-191105		04WW02-191105-FD		
			Sample Date:	01/21/2019		01/21/2019			11/05/2019		11/05/2019		
			Sample Purpose:	REG		FD			REG		FD		
			Sample Type:	GW		GW			GW		GW		
			Depth:	6.47 - 6.69 ft		6.47 - 6.69 ft			0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	Relative Percent Difference	Result	VQ	Result	VQ	Relative Percent Difference
PERCHLORATE	Perchlorate	ug/L	Yes	2	U	2	U	NC	2	U	2	U	NC

Notes:

Please see Attachment E-2 for definitions of qualifiers

ug/L - micrograms per liter

REG - regular samples shipped to the laboratory

FD - field duplicate samples shipped to the laboratory

VQ - validation qualifiers

NC - not calculated. Field precision results are calculated when target compounds are detected above the limit of quantitation in both primary and duplicate samples

Attachment E-4: Summary of Field Duplicate Results

			Location Code:	04WW09				
			Sample Number:	04WW09-190122		04WW09-190122-FD		
			Sample Date:	01/22/2019		01/22/2019		
			Sample Purpose:	REG		FD		
			Sample Type:	GW		GW		
			Depth:	6.5 - 6.74 ft		6.5 - 6.74 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	Relative Percent Difference
PERCHLORATE	Perchlorate	ug/L	Yes	2100		2300		9.09

Notes:

Please see Attachment E-2 for definitions of qualifiers

ug/L - micrograms per liter

REG - regular samples shipped to the laboratory

FD - field duplicate samples shipped to the laboratory

VQ - validation qualifiers

NC - not calculated. Field precision results are calculated when target compounds are detected above the limit of quantitation in both primary and duplicate samples

Attachment E-5: Technical Completeness

Analytical Method	Number of Analytes	Number of Samples	Number of Results	Number of Rejected Results	Number of Useable Results	Technical Completeness [Goal = 95 %] (percent)
GW Environmental Samples						
SM2320B	1	1	1	0	1	100%
SM5310	1	5	5	0	5	100%
SW6850	1	25	25	0	25	100%
SW9056	2	1	2	1	1	50%

Notes:

Not all samples have equal analytes per method

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

April 15, 2021

DAIN-ODB-LO

Ms. Lauren Poulos
U.S. Environmental Protection Agency
1201 Elm Street, Suite 500
Dallas, TX 75270-2002

Re: Final Remedial Action Completion Report, LHAAP-16 Landfill 16, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021

Dear Ms. Poulos,

An electronic copy of the above referenced document has been added to the project portal's "Documents" folder at the following address for your records: (https://docs.cbifederalservices.com/sites/501032/regulators/Shared%20Documents/Forms/AllItems.aspx). An electronic copy of this letter and download instructions for the electronic file have been sent via email. The USEPA comments dated September 22, 2020 and the TCEQ comments dated September 28, 2020 were resolved via the Draft Final report published on October 30, 2020. TCEQ accepted the Draft Final report in an email dated November 23, 2020 and USEPA accepted the Draft Final report in an email dated December 7, 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.

Sincerely,

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

Copies furnished:
A. Palmie, TCEQ, Austin, TX (electronic/online)
P. Bruckwicki, Caddo Lake NWR, TX (1 hard copy/1 CD)
R. Smith USACE, Tulsa District, OK (electronic/online)
A. Williams, USACE, Tulsa District, OK (electronic/online)

A. Maly USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (electronic/online)
P. Srivastav, APTIM, Houston, TX (electronic/online)

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

April 15, 2021

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 Remedial Action Completion Report, LHAAP-16 Landfill 16, Longhorn Army Ammunition Plant, Karnack, Texas, April 2021

Dear Ms. Palmie,

An electronic copy of the above referenced document has been added to the project portal's "Documents" folder at the following address for your records: (https://docs.cbifederalservices.com/sites/501032/regulators/Shared%20Documents/Forms/AllItems.aspx). An electronic copy of this letter and download instructions for the electronic file have been sent via email. The USEPA comments dated September 22, 2020 and the TCEQ comments dated September 28, 2020 were resolved via the Draft Final report published on October 30, 2020. TCEQ accepted the Draft Final report in an email dated November 23, 2020 and USEPA accepted the Draft Final report in an email dated December 7, 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.

Sincerely,

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

Copies furnished (letter only):
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P. Bruckwicki, Caddo Lake NWR, TX
R. Smith, USACE, Tulsa District, OK
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Final
Remedial Action Completion Report, LHAAP-16 Landfill
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers, Tulsa District
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Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
April 2021

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Acronyms and Abbreviations

µg/L	micrograms per liter
ABC+™	Anaerobic BioChem Plus
ABC™	Anaerobic BioChem
APTIM	Aptim Federal Services, LLC
bgs	below ground surface
Bhate	Bhate Environmental Associates, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	contaminant of concern
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DO	dissolved oxygen
DPT	direct-push technology
EDS-ER™	electron donor solution–extended release
ESD	Explanation of Significant Differences
EVO	emulsified vegetable oil
GWTP	groundwater treatment plant
IRA	interim remedial action
ISB	in situ bioremediation
IWWP	Installation-Wide Work Plan
Jacobs	Jacobs Engineering Group, Inc.
LHAAP	Longhorn Army Ammunition Plant
LTM	long-term monitoring
LUC	land use control
mg/L	milligrams per liter
MNA	monitored natural attenuation
mV	millivolts
No.	number
OHM	OHM Remediation Services Corporation
ORP	oxidation-reduction potential
PVC	polyvinyl chloride
RA	remedial action
RACR	Remedial Action Completion Report
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
RD	Remedial Design
Rev	revision
ROD	Record of Decision

Acronyms and Abbreviations *(continued)*

ROI	radius of influence
SCLs	sample collection logs
SDC-9™	APTIM's dechlorinating culture
SOP	standard operating procedure
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TOC	total organic carbon
U.S.	United States
U.S. Army	U.S. Department of the Army
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound
ZVI	zero valent iron

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1.0 INTRODUCTION

The United States (U.S.) Army Corps of Engineers (USACE), Tulsa District, contracted Bhate Environmental Associates, Inc. (Bhate), under the Omaha Multiple Environmental Government Acquisition National Small Business Multiple Award Task Order Contract Environmental Remediation Services with Military Munitions Response Program, Task Order No. W9128BV17F0150 to conduct environmental restoration of LHAAP-16 at Longhorn Army Ammunition Plant (LHAAP). The Bhate Team is composed of Bhate and Aptim Federal Services, LLC (APTIM). APTIM conducted the Remedial Action (RA) for LHAAP-16. LHAAP is an inactive, government owned formerly contractor operated and maintained Department of Defense facility located in central east Texas (**Figure 1-1**). This Remedial Action Completion Report (RACR) describes remedial actions taken to address risks associated with contaminated groundwater at LHAAP-16. Specifically, this RACR describes activities associated with field implementation of an in situ bioremediation (ISB) remedy in accordance with the Remedial Design (RD) (AECOM 2017) and Remedial Action Work Plan (RAWP) (Bhate 2018a) for LHAAP-16. The RD and RAWP for LHAAP-16 were finalized in January 2017 and June 2018, respectively.

1.1 Organization of Remedial Action Completion Report

This RACR is composed of the following sections:

- **Section 1.0:** "Introduction" summarizes the site description, remedial action objectives (RAOs), the contaminants of concern (COCs) and their respective cleanup levels, the selected remedy, and associated the land use control (LUC) plan.
- **Section 2.0:** "Well Installation" describes the drilling and construction of wells that were added to the previously existing well network for the purpose of injecting ISB amendments or monitoring the effects of ISB.
- **Section 3.0:** "Pre-Remedy Sampling" describes the sampling activities that were conducted prior to ISB injections and presents the associated results.
- **Section 4.0:** "In Situ Bioremediation" describes the injection of amendments to enhance microbial degradation of contaminants.
- **Section 5.0:** "Design Effectiveness Sampling" presents analytical results for samples collected to evaluate the local distribution of amendments and changes in geochemical parameters during the first few months after the injections.

- **Section 6.0**: "LUC Implementation" identifies activities that were performed to implement the LUCs in accordance with the LUC Plan in the RD and RAWP.
- **Section 7.0:** "References" provides a list of references cited in the document.

This RACR also includes the following appendices to support the text:

- **Appendix A** provides:
  - The Notice of LUCs recorded at the Harrison County Courthouse and the Survey Plat and Legal Description of the parcel subject to the LUCs.
  - The notice of LUCs for Soil and Groundwater Contamination letter provided to the landowners and occupants, federal, state, and local officials, and the Texas Department of Licensing and Registration for notification to water well drillers, as required by the LUC Plan.
  - Example LUC Inspection Checklist and Certification Forms.
- **Appendix B** consists of the Survey Report, boring logs, and construction diagrams for the injection and monitoring wells installed in 2018 and 2019 specifically to support the ISB effort.
- **Appendix C** contains sample collection logs (SCLs) associated with groundwater samples collected at wells during the Pre-Remedy and Design Effectiveness events.
- **Appendix D** includes the laboratory analytical reports for those samples that were collected during implementation of the ISB.
- **Appendix E** is the Quality Control Summary Report for the laboratory analyses.
- **Appendix F** presents potentiometric surface maps for well gauging events associated with the remediation.
- **Appendix G** consists of photographs of the field work.

1.2 Site Description

LHAAP-16 is a capped landfill covering approximately 20 acres in the south-central portion of the former LHAAP (**Figure 1-2**). Harrison Bayou is located along the eastern edge of the LHAAP-16 and flows into Caddo Lake, northeast of the former LHAAP. The landfill covered approximately 13 acres prior to cap construction. It was established in the 1940s for the disposal of solid and industrial wastes, and was used until the 1980s, when disposal activities were terminated.

The geology and hydrogeology of LHAAP-16 has been described in several documents (Jacobs 2000, Jacobs 2002, U.S. Army 2016a, AECOM 2017) and is summarized below:

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- The surface soil (outside the landfill cap) at LHAAP-16 consists of fine sandy loam.
- The subsurface is composed of medium plastic sandy silt, fine sands, and clay. The clay layers tend to separate the groundwater into shallow, intermediate, upper deep and deep zones.
- Depth to groundwater in the shallow zone ranges from approximately 4 to 25 feet below ground surface (bgs).
- An intermediate groundwater zone containing fewer fines than the shallow zone extends from 35 to 62 feet bgs.
- The upper deep groundwater zone extends from approximately 80 to 151 feet bgs.
- The lower deep groundwater zone extends below 220 feet bgs.
- Flow is primarily horizontal in the groundwater zones, but vertical interaction between the shallow and intermediate zones has been evidenced by pumping test results as well as the presence of contamination in both zones.
- Based on potentiometric data collected for the remedial investigation (Jacobs 2000), the groundwater flow direction is northeast in the shallow, intermediate and deep zones, while flow direction is southeast in the upper deep groundwater zone. More recent documents frequently show shallow and intermediate flow toward the east and southeast.
- Between 1996 and the beginning of the ISB documented in this RACR, groundwater flow between the landfill and Harrison Bayou was influenced by the operation of a groundwater extraction system.

The contaminated media at LHAAP-16 includes buried source material (landfill waste under the cap) and the shallow and intermediate groundwater beneath and downgradient of the landfill. The U.S. Army and the U.S. Environmental Protection Agency (USEPA) signed an Interim Record of Decision (ROD) (U.S. Army 1995), and the Texas Water Commission (now the Texas Commission on Environmental Quality [TCEQ]) concurred in 1995 approving an interim remedial action (IRA) for LHAAP-16 to mitigate potential risks posed by buried source material at the site. The IRA included the construction of a landfill cap, which is considered a component of the final remedy for the site. Construction of the multilayer cap was completed in 1998. The Interim ROD also specified that the U.S. Army would be required to “perform long-term maintenance of the cap” (U.S. Army 1995). LUCs, such as future use restrictions, would also be required. LUCs are discussed further in **Section 1.5**. The landfill cap prevents rainfall from infiltrating and leaching contaminants from principal threat wastes within the landfill; however, groundwater in contact with the buried waste material still provides a mechanism for transport of contaminants away from the landfill (Jacobs 2000).

The groundwater extraction system was voluntarily installed by the U.S. Army in 1996 and 1997 as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou (OHM 1998). Two extraction wells were installed in the shallow zone in 1996; two additional shallow zone extraction wells and four intermediate zone extraction wells were installed in 1997. The extraction system was shut down in August 2012 due to operational issues including damage to the power feed to the system, but operation was restored in November 2012. The extraction system was inoperable from December 26, 2018, to September 3, 2019, due to damage to the main LHAAP electrical transformer caused by power surges during storms. Following transformer replacement, the extraction system operated from September 4–27, 2019 (i.e., until completion of the ISB injections for the Bayou Biobarrier as discussed in **Section 4.5.1** of this RACR).

The Final ROD for LHAAP-16 (including the impacted groundwater) was issued in September 2016 and describes the final selected remedy for the site (U.S. Army 2016a). The groundwater COCs identified in the Final ROD include chlorinated volatile organic compounds (CVOCs) (trichloroethene [TCE], cis-1,2-dichloroethene [DCE], 1,1-DCE; 1,2-dichloroethane, vinyl chloride [VC], 1,1,2-trichloroethane, and methylene chloride), perchlorate, and metals (arsenic, chromium, manganese, nickel and thallium) in the shallow and/or intermediate groundwater. **Figure 1-3** shows the approximate lateral extent of perchlorate and TCE in the shallow and intermediate groundwater zones at LHAAP-16, based on comprehensive groundwater sampling performed in May 2013 (U.S. Army 2016a). While metals have been sporadically detected at elevated concentrations, metals results do not appear to reflect widespread contamination from the landfill.

As established in the ROD, groundwater and surface water cleanup levels are presented in **Table 1-1**. The Final RD was issued in January 2017 (AECOM 2017) and presents the design, the inspection and maintenance requirements, and the LUC requirements associated with LHAAP-16. The RAWP was reviewed by TCEQ and EPA and finalized in June 2018 (Bhate 2018a).

1.3 Remedial Action Objectives (RAOs)

The RAOs developed for LHAAP-16 and outlined in the Final LHAAP-16 ROD (U.S. Army 2016a) are:

- Protection of human health and the environment by preventing exposure to landfill contents.
- Protection of human health and the environment by reducing leaching and migration of landfill hazardous substances into the groundwater.

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- Protection of human health by preventing human exposure to the contaminated groundwater.
- Protection of human health and the environment by preventing COCs and COC by-products from migrating into Harrison Bayou at levels that cause surface water in Harrison Bayou to exceed surface water criteria.
- Return of groundwater to its potential beneficial uses as drinking water, wherever practicable.

1.4 Selected Remedy

The RA at LHAAP-16 comprises the following elements (U.S. Army 2016a):

- Maintenance of the existing landfill cap to preserve its integrity and minimize or prevent infiltration through the landfill.
- Installation of two biobarriers in the shallow groundwater, one located adjacent to the landfill, and the other located near Harrison Bayou.
- ISB in the most contaminated portion of the shallow and intermediate groundwater zones in conjunction with phased shut down of the existing groundwater extraction system.
- Performance Monitoring of both shallow and intermediate groundwater zones in the active treatment areas to monitor degradation of CVOCs and perchlorate.
  - Follow-up injections will be conducted in the ISB treatment areas if deemed necessary based on the criteria presented in Section 4.7.4 of the RAWP (Bhate 2018a).
- Monitored natural attenuation (MNA) monitoring of both the shallow and intermediate groundwater zones outside the active treatment area. MNA includes:
  - Evaluation of MNA after 2 years quarterly monitoring.
  - Per the ROD, if MNA is found to be ineffective, a contingency remedy of bio-amendment injections outside the active treatment areas will be implemented following documentation in an Explanation of Significant Differences (ESD).
- Long-term monitoring (LTM) semiannually for 3 years, then annually thereafter until recommended otherwise by the five-year review. LTM will not be initiated until MNA performance monitoring establishes the effectiveness of MNA.
- The LUC prohibiting intrusive activities (e.g., digging) within the landfill boundary will remain in place as long as landfill waste remains or until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.

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- 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 levels of COCs in surface and subsurface soil and groundwater are reduced below levels that would support unlimited use and unrestricted exposure.
- The LUC to prohibit non-residential use will remain in place until it is demonstrated that surface and subsurface soil and groundwater COCs are at levels that allow for unlimited use and unrestricted exposure.
- The LUC objectives include maintaining the integrity of any current or future remedial or monitoring systems and preventing the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and LTM remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and cleanup levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed, or become ineffective, they will be repaired or replaced with suitable components to assure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of the remedy.

Within 21 days of the issuance of the ROD, the Army proposed deadlines for completion of the RD Work Plan, RD, and RAWP. The documents were prepared and submitted to the EPA and the TCEQ pursuant to the Federal Facility Agreement. The LUC RD contained implementation and maintenance actions, including periodic inspections. The LTM plan was also presented in the RD. The Notice of Land Use Controls, including a description of the LUCs, the Survey Plat and Legal Description of the parcel subject to the LUCs was recorded in Harrison County on March 22, 2021.

The LUC Plan was incorporated into the Comprehensive LUC Management Plan (U.S. Army 2019) in the October 2019 revision. The Notice of Land Use Controls recordation is included in **Appendix A**. Letters providing initial notice of LUCs for Soil and Groundwater Contamination were sent to landowners and occupants, federal, state, and local officials and the Texas Department of Licensing and Registration on December 8, 2016 (U.S. Army 2016b), within 90 days of signature of the ROD, as required. A notification letter was also sent to

federal, state, and local officials and to the Texas Department of Licensing and Regulation (Water Well Drillers and Pump Installers Section) on February 23, 2021 showing the area covered by the final groundwater use restriction LUC (**Appendix A**). Annual inspections of the Landfill Cover and LUCs, and CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) five-year reviews of the remedy will continue until levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.

1.5 Deviations from the Work Plan

This RACR documents the field implementation of ISB at LHAAP-16. That work was performed in general accordance with the RAWP (Bhate 2018a). Those activities that deviated from the work plan are listed below:

- Two injection wells did not perform properly and were replaced by direct-push technology (DPT) points. See **Section 2.1** for details.
- Two wells installed on the east side of Harrison Bayou were classified as intermediate zone wells rather than shallow zone wells. See **Section 2.2**.
- Rather than a single pre-remedy sampling event, two different sampling events were conducted, separated by 11 months. Sampling was interrupted because excessive rainfall pushed back the completion of some wells and a power outage (caused by a transformer failure) shut down the LHAAP-16 groundwater extraction system for approximately 8 months. The second pre-remedy sampling event included a subset of the wells sampled during the first event to determine if the prolonged shutdown of the system had caused significant changes to the contaminant plumes. See **Section 3.0**.
- Three DPT locations (DPT-26 through DPT-28) at the Bayou Biobarrier had to be relocated due to the presence of a ravine. See **Section 4.3**.
- The actual sequence of injection and recirculation activities in the various treatment areas closely followed the sequence presented in the RAWP. However, injection in Biobarrier #3 overlapped with recirculation in the intermediate zone of the Mid-Plume Area, which was not specifically mentioned in the RAWP. See **Section 4.5.1**.
- Per the RAWP, extraction at the mid-plume intermediate area was to occur following injection, and the extraction wells were to be redeveloped prior to injection. Extraction was initially attempted while injection was ongoing and prior to redevelopment of the extraction wells. The extraction was stopped, and the four extraction wells were redeveloped prior to their subsequent use for both extraction and injection. See **Section 4.5.5.2**.

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- In the intermediate zone of the Mid-Plume Area, extraction was shut down, with regulatory approval, prior to seeing full bromide break-through at the extraction wells. See **Section 4.5.5.2**.
- The RAWP indicated that the first round of Design Effectiveness samples should be collected by 30 days after the injections, and a second round by 60 days after the injections. First round samples were collected from 26 to 33 days after injections. The second round of Design Effectiveness samples was collected in March 2020, more than 2 months after injections See **Section 5.0**.
- During well purging, all field-measured parameters were not fully stabilized in accordance with the Installation Wide Work Plan (IWWP) (Bhate 2018b) requirements for a few of the pre-remedy and post-injection samples. While no impact to the sample results was specifically identified, future sampling will be conducted in accordance with the IWWP, or, where full compliance cannot be achieved, documented in the field log.

1.6 Land Use Control Plan

The Final ROD (U.S. Army 2016a) indicated that the U.S. Army or its representative will be responsible for LUC implementation, certification, reporting, and enforcement. The U.S. Army will address any LUC problems within its control that are likely to impact remedy integrity as soon as practicable. The details of LUC components are provided in the RD (AECOM 2017). The continued successful implementation of LUCs will be documented in annual remedial action operation reports.

The Comprehensive LUC Management Plan (U.S. Army 2019) provides a repository for LUC plans for sites throughout the former LHAAP. The LUC Plan for LHAAP-16 can be found within the Comprehensive LUC Management Plan. That document includes blank copies of the Inspection and Maintenance Checklist and the Land Use Control Compliance Inspection Form.

The LUC Plan includes restrictions on the landfill cap and on land and groundwater use. **Appendix A** presents the Notice of LUCs and the Survey Plat and Legal Description that were filed with Harrison County. The preliminary LUC boundaries proposed in the ROD (U.S. Army 2016a) have been revised to extend farther to the east (**Figure 1-4**) due to groundwater analytical results that indicate that the plume is present beyond Harrison Bayou. Implementation of the LUC Plan will include annual inspections that are recorded on the Inspection and Maintenance Checklist and the Land Use Control Compliance Certification Form. The Checklist and the Certification Form are provided within **Appendix A**.

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1.7 Performance Monitoring and Follow-up Activities

While this RACR documents the implementation of ISB, the RAWP (Bhate 2018a) describes several activities, briefly described below, that are to be conducted following ISB. The RAWP should be referenced for detailed information (including reporting requirements) regarding the following activities:

- **Performance Monitoring Year 1 and Year 2:** Quarterly sampling will be conducted to determine geochemical conditions, volatile organic compound (VOC) concentrations, and perchlorate concentrations. Any recommendations to modify the sampling frequency, analytical parameters, or wells will be made in the Annual Remedial Action Operation Report. Additionally, the results will be used to evaluate the impacts of biodegradation reactions.
- **Follow-up Injections in Biobarriers:** As specified in the ROD, follow up injections for the biobarriers will be implemented based on evaluation of the groundwater monitoring results. The decision to reinject will be based on detailed criteria presented in the RAWP.
- **MNA Evaluation:** After two years of quarterly performance monitoring, MNA will be evaluated. The wells and analyses selected for performance monitoring for MNA evaluation are specified in the RAWP.
- **Contingency Action for MNA Areas:** A contingency remedy, involving the application of bioamendments, will be implemented for MNA areas outside the active remediation areas if the required MNA criteria are not met. The area and elements of contingency remedy will be selected based on the entire data set available. If the contingency remedy is required, it will be documented in an ESD.
- **LTM Year 3 to Next Five Year Review:** LTM will be initiated if MNA is found to be effective based on the first two years of performance monitoring. Per the Final ROD, LTM will be implemented at a semiannual frequency for three years, and then annually until the next five-year review.
- **Surface Water Monitoring:** Surface water monitoring will be conducted during quarterly performance monitoring events to ensure that concentrations do not exceed surface water standards for contaminants.
- **Metals Groundwater Monitoring:** The ROD indicates monitoring for metals will be evaluated at the first five year review to determine if any further monitoring for metals is warranted (U.S. Army 2016a). As part of the next five year review after remedy implementation, groundwater samples will be collected and analyzed for the remaining metal COCs (chromium, arsenic, nickel and/or manganese).

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2.0 WELL INSTALLATION

Between April 2018 and August 2019, 28 wells were installed at LHAAP-16 in preparation for ISB injection activities and to define the nature and extent of the groundwater contamination immediately prior to ISB. **Table 2-1** provides a list of those wells, including the purpose (injection or performance monitoring), the screen interval, and other construction details. These wells supplemented the pre-existing wells at LHAAP-16. **Figure 2-1** shows the location of the wells specifically added to support the RA (the green symbols for wells installed in 2018 and 2019) as well as the previously existing wells and piezometers (black symbols). Most of the newer wells were installed in two phases in 2018: 1) April 19 thru May 4, and 2) October 11 thru November 1. Repeated heavy rainfall events prevented access to some of the locations for months after that. Wells 16WW49, 16WW57, and 16WW58 could not be installed until August 2–7, 2019.

The wells were installed by firms with Texas-licensed drillers (Best Drilling and ETTL Engineers & Consultants, Inc.). All drilling and well installation activities were supervised by a Texas-licensed professional geologist. The well locations were surveyed by a Professional Surveyor licensed in Texas. The surveying report, boring logs, and well construction diagrams are provided in **Appendix B**.

2.1 Injection Wells

All injection wells were constructed with 2-inch diameter, schedule 40 polyvinyl chloride (PVC) risers and screens. The screens were 10 feet in length with 0.010-inch slot size. The wells were screened at the depth intervals shown in **Table 2-1**.

The six injection wells in the intermediate groundwater zone were constructed with 10-inch diameter Schedule 40 PVC isolation casing set in a clay layer at depths that varied from 20 to 35 feet bgs. The isolation casing served to confine groundwater to its zone of origin in accordance with Section 3.2 of the IWWP (Bhate 2018b). During the ISB injections, these wells were fitted with injection connections for attachment of the injection system.

Two of the intermediate zone injection wells (16IW27 and 16IW28) did not perform properly during their initial use for ISB injections on September 27, 2019. During those initial injections, when pressure was applied to the well, a mixture that appeared to contain grout, bentonite, and possibly sand began exiting from beneath the well pad at 16IW27 and up through the steel protective casing at 16IW28. While the exact cause of these grout seal failures could not be determined, there are a number of possible explanations, including flowing sands creating unstable borehole margins adjacent to the grout plug during placement, failure of the grout to set properly (potentially due to excess bentonite or water or insufficient Portland

cement in the mixture), breakdowns due to pressure fluctuations, or heaving of flowing sands into the grout while it was curing. Both wells were abandoned on October 11, 2019. The injections at those locations were subsequently conducted through temporary injection points that were installed with DPT and grouted immediately following completion of the injections.

2.2 Monitoring Wells

Monitoring wells were constructed of 4-inch diameter, schedule 40 PVC risers and screens. The well screens were 10 feet in length with 0.010-inch slot size. A filter pack consisting of 10/20 filter sand was placed around the screen from the bottom of the borehole to at least 2 feet above the screen. After the filter pack had been placed, a minimum 2-foot bentonite seal was introduced into the well above the filter pack. The bentonite seal was placed in 1-foot lifts, each hydrated for 30 minutes. After placement of the final bentonite lift, the bentonite seal was saturated with potable water and allowed to hydrate for at least an additional two hours before grouting began (per IWWP [Bhate 2018b], Section 3.2 and Standard Operating Procedure [SOP] A7.3.6). After the bentonite seal had hydrated, the remaining annulus was grouted using a Type I/II Portland cement/bentonite slurry.

Two wells were installed in different groundwater zones than proposed in the RAWP (Bhate 2018a). 16WW57 and 16WW58 were installed in the intermediate groundwater zone (rather than the shallow zone) with screen intervals of 26 to 36 and 28 to 38 feet bgs, respectively. Both wells are located on the east side of Harrison Bayou, while the LHAAP-16 landfill is west of the bayou. No shallow zone was encountered during the drilling of these wells. The wells were installed at the first water bearing zone encountered; based on depth and comparison of elevations of geologic strata with other wells, that water bearing zone correlated to the intermediate groundwater zone.

Piezometer 16PZ06 was damaged when the 2-inch diameter PVC stick-up was struck by moving equipment following construction of intermediate well 16WW49. It was repaired by cutting the broken PVC pipe to create a clean surface and then adding a new piece of PVC casing using a coupling. The location of piezometer 16PZ06 is shown in **Figure 2-1**.

2.3 Well Development

After each newly installed well had been complete for at least 24 hours, the well was developed in accordance with Section 3.2.2 of the IWWP (Bhate 2018b). Development logs are included in **Appendix B**.

Nine existing wells associated with the semi-passive biobarrier (16IW01/03/05/07 and 16EW11/12B/13/14B/15) and four existing wells at the mid-plume intermediate zone (16EW05/06/07/08) were redeveloped without being formally logged. Those existing wells were developed by pumping until the water was visibly clear and the field parameters

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(temperature, pH, specific conductivity, and turbidity measured in a flow-through cell) had stabilized.

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3.0 PRE-REMEDY SAMPLING

The RAWP (Bhate 2018a) presented a pre-remedy sampling plan that encompassed both the shallow and intermediate groundwater zones at LHAAP-16 as well as surface water from Harrison Bayou. The pre-remedy sampling of the groundwater was conducted to characterize the CVOC and perchlorate concentrations and geochemical conditions that existed prior to the ISB injections. The pre-remedy sampling results provide a baseline against which future performance monitoring results may be compared.

Pre-remedy groundwater and surface water sampling were performed in accordance with Sections 3.4 and 3.6, respectively, of the IWWP (Bhate 2018b). Groundwater sampling used low-flow methods, and the associated data were recorded on SCLs. Those SCLs are provided in **Appendix C**. Field parameters (pH, conductivity, oxidation-reduction potential [ORP], and turbidity) were recorded on the SCLs; chemical analyses were performed at offsite laboratories. The analytical results from the offsite laboratories are provided in **Appendix D**, and the Quality Control Summary Report is provided in **Appendix E**.

The pre-remedy sampling locations included wells inside and outside of the plumes and wells located upgradient of, within, and downgradient of the ISB areas. As presented in the RAWP, pre-remedy sampling was to be performed at 26 wells in the shallow zone, 19 wells in the intermediate zone, and one well in the upper deep zone. Also, three surface water sample locations were planned.

The pre-remedy sampling began in October 2018 before all wells were installed. The remaining well installations were delayed by heavy rainfall and saturated ground conditions that persisted through the spring of 2019. The final wells were installed in August 2019. Overlapping with this time period, the groundwater extraction system was inoperable from December 26, 2018 to September 3, 2019, due to damage to the main LHAAP electrical transformer as discussed in **Section 1.2**. After groundwater extraction resumed on September 4, 2019, the extraction system was run for approximately two weeks prior to sampling to allow aquifer hydraulic conditions to stabilize. To address the possibility that the October 2018 results might not be representative of conditions at the start of ISB, the September pre-remedy sampling consisted of a subset of the sampling network from the RAWP (Bhate 2018a), with concurrence from TCEQ and USEPA (TCEQ 2019, USEPA 2019), that included 16 shallow wells and 12 intermediate wells. Those groundwater samples were collected September 16–19, 2019.

Depths to groundwater were measured in conjunction with the pre-remedy sampling. Those depth-to-groundwater observations were used to create potentiometric surface maps that are

provided in **Appendix F**. Maps for the shallow and intermediate groundwater zones are provided for both October 2018 and September 2019. The extraction wells were operating during both of these pre-remedy sampling events. To provide a comparison to a time without extraction pumping, depths to groundwater were measured in June 2019 and the associated potentiometric surface maps are also included in **Appendix F**. The overall flow direction in these maps is from northwest to southeast for both the shallow and intermediate groundwater zone. This contrasts with the northeast flow direction that was mentioned in earlier documents as summarized in **Section 1.2**.

3.1 Shallow Groundwater

Pre-remedy samples were collected from 29 shallow zone wells. Of the 29 wells, 25 were sampled in October 2018 and 16 were sampled in September 2019. The parameters varied across the sampling events as shown in **Table 3-1**.

The analytical results for shallow groundwater locations are presented in **Table 3-2**. VOCs were detected above cleanup levels at 15 shallow wells at LHAAP-16. **Figure 3-1** presents the most recent pre-remedy TCE result for each well. Detections above cleanup levels were inside the 2013 plume boundaries used in the RD (AECOM 2017), indicating that the extent of contamination was not adversely affected by the shutdown of the extraction system due to the electrical outage. The wells with the highest concentrations of VOCs were (from west to east) 16WW16, 16WW36, and 16EW02, all of which contained TCE concentrations over 10,000 micrograms per liter (µg/L).

Perchlorate was detected above cleanup levels at five shallow wells. Detections of perchlorate were also inside the plume boundaries identified in 2013 (as shown on **Figure 3-2**), indicating that the extent of contamination was not adversely affected by the shutdown of the extraction system due to the electrical outage. The wells with the highest concentrations of perchlorate were 16WW16 and 16WW55, which had detections over 400 µg/L.

3.2 Intermediate and Upper Deep Groundwater

Pre-remedy samples were collected from 19 intermediate wells. Of the 19 wells, 15 were sampled in October 2018, 5 were sampled in February 2019, 2 were sampled in August 2019, and 12 were sampled in September 2019. The parameters varied across the sampling events as shown in **Table 3-3**.

The analytical results for 19 intermediate groundwater wells and one upper deep groundwater well are presented in **Table 3-4**. Pre-remedy VOC results exceeded the cleanup levels at 12 intermediate wells at LHAAP-16. The well with the highest concentrations of VOCs was 16WW35, which contained 21,000 µg/L of TCE and 19,000 µg/L of cis-1,2-DCE when sampled in October 2018. When 16WW35 was sampled again in September 2019, the

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concentrations were 13,000 µg/L of TCE and 8,800 µg/L of cis-1,2-DCE. **Figure 3-3** presents the most recent TCE result for each well. As shown in that figure, of the 12 intermediate wells with TCE above cleanup levels, 10 were inside the 2013 plume boundaries used in the RD (AECOM 2017). The other two wells that exceeded cleanup levels were newly installed wells 16WW57 and 16WW58, which are located on the east side of Harrison Bayou, outside the plume boundaries used to develop the RD. The revised TCE plume (which incorporates the 2019 results at wells 16WW57 and 16WW58) is provided in **Figure 1-4**, Final LUC Boundaries.

Perchlorate was detected above cleanup levels at four intermediate wells. Detections of perchlorate were inside the plume boundaries identified in 2013 (as shown on **Figure 3-4**). The well with the highest concentration of perchlorate was 16WW35, which contained a concentration of over 400 µg/L.

One well in the upper deep groundwater zone, 16WW21, was sampled for the pre-remedy sampling and is included in **Table 3-3** and **Table 3-4**. It was sampled in October 2018. The results for perchlorate and the selected VOCs were all below detection limits.

3.3 Surface Water

Pre-remedy surface water samples were also collected in October 2018 from three locations in Harrison Bayou: 16SW01, 16SW02, and 16SW03. The locations are shown on **Figure 3-5**. As shown in the figure, 16SW02 was collected in the portion of Harrison Bayou that may intersect the groundwater plumes. Since Harrison Bayou flows from south to north, 16SW03 is the upstream sampling location, and 16SW01 is the downstream sampling location.

In accordance with the RAWP, these samples were analyzed for specific VOCs, perchlorate, inorganics, and field parameters as noted in **Table 3-5**. The field parameters included dissolved oxygen (DO), pH, ORP, conductivity, and temperature.

The analytical results for the three sample locations are presented in **Table 3-6**. Perchlorate and the VOCs were not detected at any of the three locations.

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4.0 IN SITU BIOREMEDIATION

ISB was conducted at LHAAP-16 to remediate groundwater impacted with VOCs and perchlorate. As planned in the RD (AECOM 2017) and RAWP (Bhate 2018a), the following six ISB systems were implemented to treat the VOC and perchlorate impacted groundwater:

- A "Bayou Biobarrier" in the shallow groundwater zone near Harrison Bayou
- A biogrid in the shallow groundwater zone in the Mid-Plume Area
- A biobarrier in the intermediate groundwater zone in the Mid-Plume Area
- Landfill Biobarrier #1 in the shallow groundwater zone southwest of the Mid-Plume Area and adjacent to the landfill
- Landfill Biobarrier #2 in the shallow groundwater zone adjacent to the landfill at the location of the past Semi-Passive Biobarrier Demonstration
- Landfill Biobarrier #3 in the shallow groundwater zone adjacent to the landfill and immediately north of Landfill Biobarrier #2

The locations of the six ISB systems at LHAAP-16 are shown in **Figure 4-1**.

In addition to injection of bioaugmentation and biostimulation amendments, the implementation of ISB involved activities prior to and following the injections. The sections below describe the major steps, from notifications through demobilization, in approximate chronological order. Photographs of various aspects of the field work are included in **Appendix G**.

4.1 Notification

On April 24, 2018, U.S. Army transmitted a memorandum for record regarding "LHAAP-16 Underground Injection Control Substantive Requirements Notification" to TCEQ (Bhate 2018c). The memorandum addressed the injection of emulsified vegetable oil (EVO), APTIM's dechlorinating culture (SDC-9™), zero valent iron (ZVI), and microbial nutrients at 92 injection locations—79 DPT injection wells, 9 new injection wells, and 4 existing extraction wells.

TCEQ and USEPA were apprised of upcoming field activities via monthly meetings with U.S. Army representatives throughout the project. On August 21, 2019, the regulatory agencies were specifically notified that ISB injection activities would commence in mid-September 2019 (Bhate 2019).

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4.2 Utility Clearance

Utility location and clearance for intrusive activities were conducted prior to drilling and in accordance with Section 3.1 of the IWWP (Bhate 2018b). Utility clearance tasks included the following:

- Contacting the Texas Excavation Safety System, Inc. utility notification service.
- Verifying that all known underground installations had been located and marked, as needed, for avoidance.
- Holding safety meetings and completing job safety analyses with all personnel who were involved in intrusive activities.

4.3 Site Clearance and Staking Locations

Prior to the ISB injection, the sites were cleared of aboveground hazards. The DPT injection point locations were staked out relative to specific locations—either surveyed points or existing wells. Due to field obstructions and the global positioning system interference caused by overhead canopy obstruction in some parts of LHAAP-16, some newly installed well locations differed from the locations proposed in the RAWP. In those instances, the DPT locations were field adjusted to more closely align with the planned location and length of the treatment zone. Additionally, at the Bayou Biobarrier, three DPT locations (DPT-26 thru DPT-28) had to be relocated due to a deep ravine present in the planned locations that was not accessible to the tracked DPT rig; the points were shifted 15 feet due east to locations that the DPT rig could access.

4.4 Mobilization

Personnel and equipment were mobilized and demobilized as needed for different aspects of the injection work from September thru December 2019.

The following major pieces of equipment were mobilized over the course of the injections:

- DPT drill rig
- Injection systems
  - One trailer-mounted system was mobilized specifically for the injections at the Bayou Biobarrier
  - A temporary injection/recirculation system was assembled on site for activities at the mid-plume intermediate zone biobarrier
  - A second trailer-mounted system was mobilized for the remaining areas

- Two 20,000 gallon fractionation tanks for mixing and storage of the amendment solution for LHAAP-16 as a whole
- One mobile 4,000 gallon tank for holding amendment solution during the injection at each area within LHAAP-16
- One vertical 1,500 gallon tank for collection of extracted groundwater prior to recirculation

Amendments were delivered directly to site LHAAP-16 and stored on site. The carbon substrate and the nutrients were delivered in caged 275-gallon IBC containers. Buffer was delivered in 55-pound bags. The ZVI was contained in 5-gallon buckets. The microbial consortium was delivered in pressurized 5-gallon stainless steel cannisters and stored in a refrigerated state until used.

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4.5 Injections

The injections were performed as six different systems:

- One biobarrier in the shallow groundwater zone near Harrison Bayou
- One biogrid in the shallow groundwater zone in the Mid-Plume Area
- One biobarrier in the intermediate groundwater zone in the Mid-Plume Area
- Three landfill biobarriers in the shallow groundwater zone adjacent to the landfill

The implementation of the biobarriers and the biogrid involved the injection of an electron donor and a microbial consortium capable of biodegrading CVOCs and perchlorate. The injection amendments and locations were based on the Final RD (AECOM 2017) as detailed in the RAWP (Bhate 2018a).

The primary biodegradation pathway for chlorinated ethenes, such as tetrachloroethene and TCE, is reductive dechlorination, which occurs under highly reducing anaerobic conditions. During reductive dechlorination, chlorinated ethenes are used instead of oxygen as respiratory substrates by the anaerobic microorganisms that reduce the chlorinated ethenes to harmless by-products. Favorable aquifer conditions are established and/or maintained by adding a carbon source, such as EVO, to act as an electron donor. Details of the activities for each of the systems are described in the following sections.

4.5.1 Overall Sequence of Injections

The RD (AECOM 2017) called for the ISB injections in the most contaminated portions of the shallow and intermediate groundwater zones to be implemented in conjunction with phased shut down of the existing groundwater extraction system. Due to electrical power problems at

LHAAP, the eight groundwater extraction pumps at LHAAP-16 did not operate from approximately late December 2018 until September 4, 2019. Starting September 4, 2019, the pumps were run for two weeks before groundwater samples were collected at the subset of wells selected for the final round of pre-remedy sampling (see **Section 3.0**). The system continued to run until September 27, 2019. Thus, the groundwater extraction system was withdrawing groundwater from both the shallow and intermediate zones in the vicinity of the proposed mid-plume injection area during most of September. The ISB activities were implemented in the following sequence:

1) While groundwater continued to be extracted from the Mid-Plume Area, amendments were injected at the Bayou Biobarrier from September 24–26, 2019. These injection points formed a barrier just west and upgradient of Harrison Bayou to treat contaminants migrating eastward from the landfill and toward the bayou. This phase of the ISB injection was conducted before shutting down extraction at the Mid-Plume Area. This timing was intended to limit contaminant migration to the creek that might otherwise have occurred in the absence of the hydraulic control provided by the groundwater extraction system. Unlike the other injections, the amendments for the Bayou Biobarrier included microscale ZVI, a reducing agent, in addition to a carbon substrate (**Table 4-1**). The ZVI was added to accelerate remediation at LHAAP-16 by promoting abiotic degradation of CVOCs.
2) The extraction of groundwater from the shallow and intermediate zones in the Mid-Plume Area was shut down on September 27, 2019.
3) Amendments were initially injected into the intermediate zone of the Mid-Plume Area from September 27–29, 2019. Grout was dislodged from two of the injection wells (see **Section 2.1**); therefore, injection at those two locations was finished using DPT injection points on October 9–14, 2019. Groundwater was recirculated in the intermediate zone from September 27 to November 14, 2019. Then further amendment injections were conducted November 16–22, 2019.
4) Amendments were injected into the shallow groundwater zone in the Mid-Plume Area from September 30 to October 11, 2019. As noted above, groundwater was being recirculated in the intermediate zone within the Mid-Plume Area at this time.
5) Amendments were injected at Landfill Biobarrier #1 from October 15–18, 2019. As noted above, groundwater was being recirculated in the intermediate zone within the Mid-Plume Area at this time.
6) Amendments were injected at Landfill Biobarrier #3 on October 19, 2019, while groundwater recirculation continued in the intermediate zone within the Mid-Plume Area.

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7) Amendments were injected at Landfill Biobarrier #2 on December 3–4 and 20–21, 2019. Extraction was conducted from December 3–18, 2019. The extracted water was reinjected from December 11–19, 2019.

The actual sequence of injection and recirculation activities in the various treatment areas did not differ significantly from the sequence presented in the RAWP (Bhate 2018a). Injection in Biobarrier #3 did overlap with recirculation in the intermediate zone of the Mid-Plume Area. The RAWP did not specifically address this possibility, but it did allow injection in Biobarrier #1 during that recirculation period. Biobarrier #1 is in the shallow zone like Biobarrier #3 but the northern portion of Biobarrier #1 is closer to the Mid-Plume Area than Biobarrier #3. Therefore, the timing of injection at Biobarrier #3, like Biobarrier #1, is not thought to have been problematic.

During the injections, bromide was added to the ISB amendment mixture to act as a tracer of the amendment mixture as groundwater was being extracted to enhance the distribution of the injectate. Bromide proved difficult to recover; however, any changes in the sequence of injection and extraction, are not thought to have affected the ability to recover bromide. Once bromide is in the aquifer it is expected to move along with the prevailing groundwater flow. However, bromide moves more easily with groundwater than the carbon substrate due to less retention on the aquifer material. During extraction a significant increase in bromide was not observed, which suggests that the extraction wells may not have created a sufficient drawdown to capture the bromide and it may have moved quicker downgradient. It is also possible that switching extraction between different intermediate zone wells, as required by the RAWP, may have pulled the injectate and bromide in different directions, thus diminishing the chances of bromide being detected in certain extraction wells. Therefore, groundwater was also analyzed for total organic carbon (TOC) as TOC has a higher retention to the aquifer material. Elevated levels of TOC were observed, and it was determined that the carbon substrate had been distributed.

4.5.2 Amendment Preparation

Approximately 24 hours prior to the start of each injection cycle, the solution of ISB amendments was prepared in a 20,000-gallon mixing tank at LHAAP-16. The water was obtained from Leigh Water Supply in Karnack, Texas, and transported to the mixing tank in a water truck. The solution was prepared by adding the required volume of carbon substrate, dilution water (1:10 mixing ratio), nutrients, and a small volume of a dechlorinating microbial consortium into the mixing tank (**Table 4-1**). During mixing, a conservative tracer sodium bromide (at a target concentration of 500 milligrams per liter [mg/L]) was added to the solution as a possible means of evaluating the distribution of amendments. The microbes consumed the available oxygen in the mixing tank, creating an anaerobic medium. When the solution was

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verified to be anaerobic, based on a DO meter reading of less than 1.0 mg/L, the remaining bioaugmentation culture was added to the mixing tank and recirculated.

Table 4-1 presents the approximate amounts of all components that were mixed to prepare the amendment solution for each injection area. As shown on that table, the primary injection components were the carbon source and SDC-9™. The same carbon source (an EVO known as electron donor solution–extended release [EDS-ER™] from Tersus Environmental, LLC) was used for all injection mixtures except for that used at the Bayou Biobarrier. EDS-ER™ was supplied as a water mixable oil that contains no water; therefore, it was mixed with water in the field. The EDS-ER™ is an EVO, which should not require replenishment for 3 to 5 years (AECOM 2017). At the Bayou Biobarrier, the amendment mixture used Anaerobic BioChem Plus (ABC+™), which comprises microscale ZVI and a carbon source (ABC™) formulated to be mixed on site with the ZVI. The ZVI was intended to supplement the other amendments and accelerate degradation of the site COCs. The masses of the components of the amendment mixture were based on the information presented in the RD (AECOM 2017) and RAWP (Bhate 2018a).

4.5.3 Injection Process

After the anaerobic solution containing each of the amendments had been prepared, the amendments were transported in the water truck to the mobile 4,000 gallon tank and injected into the subsurface using the system shown schematically in **Figure 4-2**.

Amendments were injected into the subsurface through either DPT injection points or previously installed wells:

- Eighty injection points were installed using a DPT rig. This included 78 points per the original RAWP (Bhate 2018a) (DPT-01 thru DPT-35 and DPT-37 thru DPT-79) plus two temporary injection points at the Intermediate Zone Mid-Plume (16TIP27 and 16TIP28) to replace 16IW27 and 16IW28. DPT drilling was conducted in accordance with the procedures presented in the IWWP (Bhate 2018b). Prior to DPT use, locations were hand dug or probed to 5 feet to check for underground obstructions/utilities. The DPT rig would then push to the required depth, and amendment was injected through the probe rod, proceeding upward from the bottom. At the Bayou Biobarrier, the amendment was injected in 2-foot intervals until the target interval was covered. At all other DPT locations, the initial injection was in the bottom 1- or 2-foot interval followed by 4-foot intervals thereafter. After injections had been implemented up the entire target interval, the probe was withdrawn and the DPT point was abandoned by filling with grout. No soil cuttings were generated using DPT.

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- A total of 22 previously installed wells were used to inject amendments, including 9 extraction wells (16EW05-08, 16EW11, 16EW12B, 16EW13, 16EW14B, and 16EW15) and 13 injection wells (16IW01, 16IW03, 16IW05, 16IW07, 16IW09, 16IW10, 16IW20, and 16IW25-30). As noted earlier, two of the injection wells (16IW27 and 16IW28) did not function properly and were abandoned. DPT points 16TIP27 and 16TIP28 were used to implement the injections at those two locations.

The previously installed wells were also used for recirculation at two areas. At the Mid-Plume Intermediate Zone Biobarrier, groundwater was extracted from wells 16EW05-08 and later reinjected into wells 16IW25-26 and 16IW29-30. At Landfill Biobarrier #2, groundwater was extracted from wells 16EW11, 16EW12B, 16EW13, 16EW14B, and 16EW15 and reinjected into wells 16IW01, 16IW03, 16IW05, and 16IW07.

The injection, extraction, and recirculation volumes at each of the six areas are provided in **Table 4-2**.

The injection system allowed injection at up to four wells or DPT points simultaneously under low pressure (i.e., less than 40 pounds per square inch). The injection system included individual volume and pressure gauges for each outlet from the injection manifold so that pressure and flow rates could be controlled independently, and amendment volume could be recorded for each injection location. The injection system was connected to the wells or to DPT probes with hoses. During the injection and recirculation activities, field personnel performed the following:

- Checked the injection system gauges to monitor pressure, volume, and flow rate into each injection point (DPT or well).
- Recorded injection interval, volume, time, flowrate, and pressure.
- Monitored injection pressures for sudden decreases that might indicate the loss of amendment in the subsurface (possibly due to fracturing induced by the injection or encountering a high-permeability zone).
- Monitored the injection/recirculation locations visually for surfacing of injected material (it was such monitoring that identified the problems at 16IW27 and 16IW28 described above).
- Monitored Harrison Bayou for visual changes and changes in DO concentration during injections at the Bayou Biobarrier.

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4.5.4 Bayou Biobarrier

The Bayou Biobarrier was installed west of Harrison Bayou by injecting the amendment mixture into thirteen DPT points (DPT-26 thru DPT-35 and DPT-37 thru DPT-39) and one injection well (16IW20) as shown in **Figure 4-3**. As identified in **Table 4-1**, the amendment mixture comprised ABC+™ (carbon substrate plus microscale ZVI), SDC-9™ and sodium bromide tracer. **Table 4-2** provides the volume of amendment mixture injected at each injection point. A slow injection rate was used to reduce chances of surfacing and reaching the bayou. Monitoring wells 16WW40 and 16WW56 were used as injection control wells and were visually monitored hourly during injections to determine if injectate was reaching these wells, which were intended to be outside the radius of influence (ROI).

In conjunction with ISB injections at the Bayou Biobarrier, field staff measured DO concentrations in Harrison Bayou and visually checked for evidence of injectate reaching the bayou. The DO concentrations and visual observations were recorded and are presented in **Table 4-3**. DO readings were collected using a hand-held field instrument to get a direct measurement of DO in the bayou. If the injectate had reached the bayou, organisms in the bayou could have utilized the DO in the bayou water to metabolize the injected carbon (EVO) and caused a decrease of DO in the bayou. Such a decrease of DO could have potentially created anaerobic conditions in the water and adversely impacted the aquatic life in the bayou. Visual observations were intended to identify any changes in the appearance of the water in the bayou (e.g., murkiness) that might indicate that the injectate was entering the surface water. No significant changes in DO were recorded during or after the injections at the Bayou Biobarrier. Also, evidence of injected amendments was never observed in the bayou.

4.5.5 Mid-Plume Area

ISB in the Mid-Plume Area included injections in both the shallow and intermediate groundwater zones. The injected amendment was a mixture of EDS-ER™, nutrients, SDC-9™, and sodium bromide (as a tracer) as presented in **Table 4-1**.

4.5.5.1 Shallow Groundwater

To treat the VOC and perchlorate impacted groundwater in the shallow groundwater aquifer, a biogrid was installed by injecting amendments into forty DPT points (DPT-40 thru DPT-79) as shown in **Figure 4-4**. Prior to these injections, the shallow zone extraction wells in the Mid-Plume Area (16EW01, 16EW02, 16EW03, and 16EW04) were shut down. **Table 4-2** lists the volume of amendment mixture injected at each injection point as well as the injection interval.

4.5.5.2 Intermediate Zone Biobarrier in Mid-Plume Area

To treat the intermediate groundwater zone, a biobarrier was created. The biobarrier was installed through a phased approach:

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- Initially, the amendment was injected into six newly installed injection wells. As discussed in **Section 2.0**, the six new injection wells had been installed in the intermediate zone to recirculate groundwater for ISB. The wells had been installed as pairs between existing extraction wells:
  - Injection wells16IW25 and 16IW26 were installed between existing extraction wells 16EW05 and 16EW06.
  - Injection wells 16IW27 and 16IW28 were installed between existing extraction wells 16EW06 and 16EW07. These injection wells did not perform properly. Temporary injection points 16TIP27 and 16TIP were later used for the injections.
  - Injection wells 16IW29 and 16IW20 were installed between existing extraction wells 16EW07 and 16EW08.

  Injection at the 16IW25/16IW26 and 16IW29/16IW30 was performed between September 27 and October 1, 2019. Injection at the two temporary injection points was implemented on October 9–14, 2019.

- Following the injections, the RAWP called for the four existing extraction wells (16EW05 through 16EW08) to be used to draw groundwater away from the injection wells and towards the extraction wells until an increase in bromide was detected in the extraction wells. Extraction from wells 16EW05 through 16EW08 was attempted from September 27 to October 1 at the same time that injections were on-going. This was unsuccessful due to operational problems with the extraction pumps and silt in at least one of the wells. The four extraction wells had also not yet been redeveloped. Therefore, extraction was postponed until the injections were completed and the wells were redeveloped, bringing the activity into accord with the RAWP. The pump problems were also resolved during that time, and extraction resumed three days after the amendment injection was completed. The extracted groundwater was temporarily stored in the onsite tank and then recirculated back into injection wells 16IW25, 16IW26, 16IW29, and 16IW30. Injection wells 16IW27 and 16IW28 could not be used for recirculation as proposed in the RAWP; they were plugged and abandoned due to earlier performance issues. The extraction and reinjection wells were alternated every 3 days and samples of groundwater were collected from extraction wells and tested for bromide and TOC every 3 days to evaluate whether the injected amendments were being drawn to the extraction wells. Bromide and TOC results are provided in **Table 4-4**. When bromide was detected significantly above pre-remedy concentrations in an extraction well, extraction from that well was to be shut down. Recirculation of the mid-plume intermediate bio-barrier was discontinued after four weeks, with regulatory approval. Definitive increases in bromide or TOC concentrations did not occur at all wells, but the regulators concurred that the

extraction had continued long enough and that continued reinjection of extracted water could have resulted in dilution of the intended biobarrier formation.

- After extraction was shut down in all the extraction wells, amendment mixture was injected into the four extraction wells.

The well locations are shown on **Figure 4-5**. **Table 4-2** specifies the volume of amendment mixture injected at each injection point along with the amendment mixture quantities.

4.5.6 Landfill Biobarriers

Three landfill biobarriers were installed to control the migration of VOCs and perchlorate in shallow groundwater immediately downgradient of the landfill. As noted in the RD (AECOM 2017), the location of the barriers was designed to fully intercept the shallow groundwater plumes of chlorinated VOCs and perchlorate above their respective cleanup levels. The injection solution was a mixture of EDS-ER™, nutrients, SDC-9™, and sodium bromide (as a tracer) as presented in **Table 4-1**.

4.5.6.1 Landfill Biobarrier #1

Landfill Biobarrier #1 was installed by injecting the injection solution into 18 DPT points (DPT01 thru DPT18) and one injection well (16IW09) as shown in **Figure 4-6**. A spacing of 15 feet between injection locations was used based on the ROI presented in the ROD (U.S. Army 2016a). **Table 4-2** shows the volume of amendment injected at each injection point/well. The injections at this area proceeded according to plan and were completed in one week, from October 10–17, 2019.

4.5.6.2 Landfill Biobarrier #2

Installation of Landfill Biobarrier #2 involved two phases—injection and recirculation. Both phases utilized existing wells installed during the Environmental Security Technology Certification Program study (Geosyntec 2009). Prior to using the pilot test wells for injections, the wells were redeveloped as discussed in **Section 2.3**. The injection locations are shown on **Figure 4-7**. **Table 4-2** identifies the injection locations and the volume of amendment mixture injected at each location.

Phase 1 involved injecting amendment into injection wells 16IW01, 16IW03, 16IW05, and 16IW07. Water was then extracted from wells 16EW11, 16EW12B, 16EW13, 16EW14B, and 16EW15 and recirculated in the injection wells to enhance cross gradient distribution of the amendment mixture. Pumps and piping were temporarily installed for the extraction. The extracted groundwater was stored in the empty mixing tank. Once the amendment design volume was injected, samples of the extracted groundwater were collected from extraction wells and tested for bromide and TOC. Bromide and TOC results are provided in **Table 4-5**.

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When TOC results were above pre-remedy levels, the extraction and recirculation were stopped. During Phase 2 of the injections, the extraction and recirculation were shut down. Phase 2 used the remaining extracted groundwater collected in the onsite tank. The water accumulated from Phase 1 was used to make the amendment mixture for Phase 2. The extracted groundwater was mixed with the amendment mixture and injected back into the five extraction wells. One part of the concentrated EVO solution was mixed with 10 parts of extracted groundwater and injected into extraction wells 16EW11, 16EW12B, 16EW13, 16EW14B, and 16EW15. The amendment mixture quantities and injection volumes are shown on **Table 4-1** and **Table 4-2**, respectively.

The Phase 1 injection at 16IW01/03/05/07 was performed on December 3–4, 2019. Water was extracted at 16EW/11/12B/13/14B/15 from December 3–18, 2019 and recirculated into the four injections wells from December 11–19, 2019. The Phase 2 injection at 16EW/11/12B/13/14B/15 was performed on December 20, 2019.

4.5.6.3 Landfill Biobarrier #3

Biobarrier #3 was installed by injecting the amendment mixture in seven DPT points (DPT19 thru DPT25) and one injection well (16IW10). A spacing of 15 feet between injection locations was used based on the ROI presented in the ROD (U.S. Army 2016a). The seven DPT points and one injection well are shown in **Figure 4-8**. **Table 4-2** provides the volumes of amendment mixture injected at each injection point/well. The injections at this area proceeded according to plan and were completed on October 19, 2019.

4.6 Management of Remediation Derived Waste

During the activities described above and in **Section 3**, various types of waste were generated. Those wastes are identified in the chart provided below. The table also summarizes the storage and disposal for each waste type.

Waste Type	Storage and Disposal *
Soil cuttings from installation of new monitoring and injection wells	Collected in drums and held at the well site pending analytical results. The cuttings were sampled at the frequency of one sample per 20 drums. Analytical results (provided in **Appendix D**) showed that the cuttings were not contaminated, so the cuttings were spread on site at the well locations.
Groundwater from development of new and existing wells	Collected in drums and transported to the GWTP for disposal.
Groundwater from purging of wells prior to sampling	Collected in 5-gallon containers and transported to the GWTP for disposal.
Disposable personal protective equipment, disposable supplies, and trash	Disposed as municipal solid waste.

* GWTP refers to the Groundwater Treatment Plant at site LHAAP-18/24.

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4.7 Demobilization

After completion of the final injections, which were at Landfill Biobarrier #2 on December 19, 2019, the injection rig and amendment tanks were demobilized from LHAAP-16.

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5.0 DESIGN EFFECTIVENESS MONITORING

Groundwater samples were collected approximately one month after the ISB injection at each of the six treatment areas and analyzed to evaluate design effectiveness. Effectiveness is evaluated based on whether the injections successfully distributed amendments within the design ROI and achieved the goal of creating conditions conducive for reductive dechlorination of the COCs. The successful distribution of amendments was based on changes in TOC and bromide concentrations. Conditions conducive to reductive dechlorination were considered to be ORP less than -50 millivolts (mV) and DO less than 1 mg/L.

The first round of design effectiveness samples was collected from wells identified in the RAWP (Bhate 2018a). The first round was collected approximately one month after completion of injection in each area. As discussed below, the results were mixed. The RAWP indicated that a second round of design effectiveness sampling might be performed if the first round was inconclusive. The RAWP indicated that both rounds of samples would be collected "within the first two months of remedy implementation". However, the areas were completed sequentially, so the first-round data was collected over several weeks. That timing, plus additional time to evaluate and discuss the first-round results with regulatory agency representatives, rendered impractical the collection of the second round of samples within the two-month time frame mentioned in the RAWP. The second- round samples were collected in March 2020 once the project team arrived at a consensus on the list of wells needing a second round of sampling. This section provides a discussion of the results for TOC, bromide, DO, ORP, and pH. Where available, results are presented for samples before, during, and after the ISB injections. The results are provided for each of the six injection areas as follows:

Injection Area	Design Effectiveness Results	Figure Showing Sample Locations
Bayou Biobarrier	Table 5-1	Figure 4-3
Mid-Plume Shallow Zone Biogrid	Table 5-2	Figure 4-4
Mid-Plume Intermediate Zone Biobarrier	Table 5-3	Figure 4-5
Landfill Biobarrier #1	Table 5-4	Figure 4-6
Landfill Biobarrier #2	Table 5-5	Figure 4-7
Landfill Biobarrier #3	Table 5-6	Figure 4-8

Of the wells designated for design effectiveness sampling, most are at distances from the reaction zones such that geochemical changes due to the ISB may not be detectable immediately but require additional time. Few of the wells were within the 15 feet design ROI, where changes should have been detectable within the time frames of the design effectiveness sampling events. Nonetheless, within each of the six injection areas, there were results that

demonstrated the successful distribution of amendments and the start of changing geochemical conditions to support reductive dechlorination.

5.1 Bayou Biobarrier

At the Bayou Biobarrier, the two key wells located within the barrier, near the injection points, were 16IW20 and 16RW11. Neither location had a pre-remedy sample collected, but both locations showed effects from the injections. Amendments were injected at the Bayou Biobarrier between September 24–26, 2019. On October 22, 2019, the TOC (3,290 mg/L) and bromide (213 mg/L) results at 16RW11 clearly indicated that the location was within the injection radius of the nearby injection points. In October 2019, 16IW20 did not have high TOC and bromide values, but this location did have low DO (0.04 mg/L), and negative ORP (-182 mV), which indicate geochemical conditions that are supportive of reductive dechlorination. Injection well 16IW20 was sampled again on March 9, 2020; the DO had increased (2.6 mg/L), but the ORP decreased further (-230 mV). The ORP at well 16RW12 (slightly downgradient of the biobarrier) decreased from 163.3 mV about one week before the injections to -37 mV four weeks afterwards, while the ORP at well 16WW12 (slightly upgradient of the biobarrier) decreased from 159 mV four weeks after the injections to 7 mV in March 2020. Neither of these wells, nor wells further from the reaction zone, showed significant increases in TOC or bromide.

5.2 Mid-Plume Shallow Biogrid

One of the four extraction well locations used for design effectiveness sampling (16EW03) was within the design ROI from the DPT injection locations shown on **Figure 4-4**. The results from 16EW03 show slightly elevated TOC (22.6 mg/L) and bromide (5.3 mg/L) relative to the other sampling locations in the shallow Mid-Plume Area and the DO (0.39 mg/L) and ORP (-110.1 mV) are supportive of reductive dechlorination. These results indicate the presence of injected amendments and improving geochemical conditions. At the only location with a pre-remedy sample collected (16EW02), ORP readings in November 2019 and March 2020 were slightly lower than the pre-remedy concentrations, but DO values were inconsistent. The other two wells are outside and cross-gradient from the treated area, and their results did not indicate any impact from the injections.

5.3 Mid-Plume Intermediate Biobarrier

The mid-plume intermediate zone wells (16EW05, 16EW06, 16EW07, and 16EW08) were used as part of a recirculation system attempting to enhance the distribution of amendments in the intermediate zone. Following several weeks of recirculation with mixed results depicted in the sampling data, each of the locations was used as an injection location to add additional amendments per the RAWP. As a result, all four of the wells showed significantly elevated TOC and bromide. The DO at each location was below 0.1 mg/L and the ORP at each location

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was negative, indicating that the injections impacted the geochemical conditions in the Mid-Plume Area.

5.4 Landfill Biobarrier #1

The key locations within Landfill Biobarrier #1 are 16IW09 and 16RW03. At 16IW09, the high bromide (70.7 mg/L) and TOC (7,820 mg/L) indicate clearly that the injection location received amendments, and the low ORP (-88 mV) and DO (0.04 mg/L) are supportive of biodegradation. Monitoring well 16RW03 was slightly farther from the injection locations and did not show any significant impact from the amendments or geochemical changes. Monitoring well 16RW05 downgradient shows significant impact from bromide (75.4 mg/L) and TOC (791 mg/L), as well as geochemical conditions conducive for reductive dechlorination (DO 0.05 mg/L and ORP -178 mV), which may indicate some degree of localized preferential flow from the injections. Design effectiveness samples were collected at 16RW04, 16WW26, 16RW03, and 16WW42 in both November 2019 and March 2020, but none of these locations had elevated TOC or bromide results. Additionally, the locations with pre-remedy results for the field parameters (16WW26 and 16WW42) did not present any indication of ISB effects in either round of design effectiveness sampling.

5.5 Landfill Biobarrier #2

The key locations within Landfill Biobarrier #2 are 16IW03 and 16IW04. At injection location 16IW03, the bromide was not significantly elevated (0.66 mg/L), but the elevated TOC (222 mg/L) indicated that the injection location received sufficient carbon source to support biodegradation. The low ORP (-78 mV) and DO (0.04 mg/L) were supportive of biodegradation as well. 16IW04 was approximately 15 feet from an injection location, but neither the January nor March results showed definitively elevated TOC or bromide. The four downgradient monitoring locations (16PM06, 16PM09, 16PM14, and 16WW36) did not show any definitively elevated bromide or TOC, but the low DO values indicated conditions that may be supportive of reductive dechlorination.

5.6 Landfill Biobarrier #3

The key locations within Landfill Biobarrier #3 were 16RW08 and 16IW10. At 16IW10, the TOC (1,850 mg/L) and bromide (201 mg/L) clearly reflected its use as an injection location. Monitoring well 16RW08 did not show clear indication that it had been reached by amendments (bromide was 6.06 mg/L in November 2019 and 5.10 mg/L in March 2020), and the ORP (90 mV in November 2019 and 28 mV in March 2020) remained higher than desired. The low DO values (<1 mg/L) at all the design effectiveness sample locations indicated that conditions at and downgradient of the injection area may be trending in the right direction.

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5.7 Future Performance Monitoring

As noted in **Section 1.7**, this RACR documents the implementation of ISB, but activities that follow the ISB are described in the RAWP (Bhate 2018a). **Section 1.7** provides a brief description of those activities, but the RAWP should be referenced for detailed information. The next document for LHAAP-16 will be the Annual Remedial Action Operations Report, which will present and evaluate data from the first four quarters of performance monitoring.

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6.0 LUC IMPLEMENTATION

The actions required to implement the LUCs for LHAAP-16 are described below. An initial notice of LUCs for Soil and Groundwater Contamination was completed on December 8, 2016, within 90 days of ROD signature as required (U.S. Army 2016b). The Notice of LUCs, including the final LUC boundary survey plat and legal description of the LUC boundary filed with Harrison County on March 22, 2021, is included in **Appendix A**. A second Notice of LUCs for Soil and Groundwater Contamination was sent to federal, state, and local officials, and to the Texas Department of Licensing and Regulation (Water Well Drillers and Pump Installers Section) on February 23, 2021, showing the final area covered by the groundwater use restriction LUC (**Appendix A**).

The following actions were performed to implement LUCs for LHAAP-16:

- Finalize the boundaries of the LUCs as part of the remedial action (See **Figure 1-4** and **Appendix A**).
- Survey the LUC boundaries. The final boundaries were surveyed by a State of Texas licensed surveyor. Legal descriptions of the surveyed areas accompany the survey plat.
- Record the Notice of LUCs at Harrison County. The LUC plats and legal descriptions and LUC restriction language were recorded at the Harrison County Courthouse in accordance with Title 30 TAC §335.566 (**Appendix A**).
- Transmit the notice to federal, state, and local governments involved at LHAAP-16, and to owners and occupants of the property who are subject to restrictions and LUCs. The notice of the final boundaries for LUCs was sent to federal, state, and local officials including:
  - State Representatives, the Harrison County Judge, Harrison County Historical Commission, the City of Uncertain Mayor, and Caddo Lake and Leigh Water Supply Corporations' Presidents. Notice was also sent to the Caddo Lake National Wildlife Refuge Manager—as a representative of the U.S. Fish and Wildlife Service (the future transferee of the property), and the Water Well Driller and Pump Installers Program at the Texas Department of Licensing and Registration.

Following implementation of the LUCs, administrative maintenance is required to ensure LUCs remain in place and effective. Maintenance activities will include:

- Annual field inspections of LHAAP-16 to confirm that no violations of the LUCs have occurred. Documentation of the inspection will be included on the Inspection and Maintenance Checklist (see **Appendix A**).
- Annual certifications that no LUC-restricted activities have been authorized and that LHAAP-16 conditions and use are consistent with the LUCs. The Annual LUC Compliance Certification Form is presented in **Appendix A**.
- Periodic transmittal of a LUC Notice to federal, state, and local authorities. The notice will include the land use restrictions referenced in the ROD, a written description of the LUCs, and a figure depicting the LUC boundaries. The transmittal will coincide with each Five Year Review and will be documented in the report.
- The Final LUC Boundaries and copies of filed notices have been added to the Comprehensive LUC Management Plan and the plan was provided to the owner or occupant of LHAAP-16. The update to the Comprehensive LUC Management Plan will be completed during the next annual update, which will be in 2021.

The U.S. Army will address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable.

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Tables

Table 1-1
Groundwater and Surface Water Cleanup Levels at LHAAP-16

COC	Cleanup Level (µg/L)
	MCL
Trichloroethene	5
cis-1,2-dichlorethene	70
1,1-dichloroethene	7
1,2-dichloroethane	5
Vinyl Chloride	2
1,1,2-trichloroethane	5
Methylene Chloride	5
Chromium	100
Arsenic	10
Thallium	2
	TRRP Tier 1 Groundwater Residential PCLs
Nickel	490
Perchlorate	17
Manganese	1,100 [a]

Notes:

[a] 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.

µg/L - micrograms per liter

COC - contaminant of concern

MCL - maximum contaminant level

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

UTL - upper tolerance limit

Table 2-1
Wells Added for Remedial Action at LHAAP-16

Well ID	Purpose		Northing (feet)	Easting (feet)	Top of Casing Elevation (ft amsl)	Surface Elevation (ft amsl)	Diameter (inches)	Screen Interval (feet bgs)	Groundwater Zone	Installation Completion Date
	Injection	Performance Monitoring								
16IW09	✓		6953396.09	3314160.35	181.41	178.08	2	8-18	Shallow	10/31/2018
16IW10	✓	✓	6953780.74	3314013.26	195.90	192.69	2	15-25	Shallow	4/25/2018
16IW20	✓		6953823.60	3314557.01	188.94	186.03	2	12-22	Shallow	5/3/2018
16IW25	✓		6953777.99	3314293.02	199.24	196.29	2	40.5-50.5	Intermediate	5/1/2018
16IW26	✓		6953754.86	3314304.29	198.97	195.66	2	39.5-49.5	Intermediate	5/2/2018
16IW27	✓		6953691.80	3314332.92	196.05	193.04	2	44.5-54.5	Intermediate	5/2/2018
16IW28	✓		6953655.99	3314347.06	189.50	186.62	2	38.5-48.5	Intermediate	5/1/2018
16IW29	✓		6953590.95	3314379.27	185.89	182.76	2	35.5-45.5	Intermediate	5/1/2018
16IW30	✓		6953570.27	3314398.21	184.74	181.72	2	30.5-40.5	Intermediate	4/30/2018
16RW01		✓	6953551.08	3314168.77	189.77	186.56	4	15-25	Shallow	10/31/2018
16RW02		✓	6953440.13	3314139.68	182.97	179.94	4	8-18	Shallow	10/12/2018
16RW03		✓	6953407.93	3314167.37	181.66	178.32	4	10-20	Shallow	10/11/2018
16RW04		✓	6953535.89	3314226.20	190.94	188.04	4	14-24	Shallow	10/31/2018
16RW05		✓	6953395.99	3314192.31	180.70	177.61	4	10-20	Shallow	10/11/2018
16RW06		✓	6953828.03	3313990.94	197.37	194.35	4	15.5-25.5	Shallow	4/23/2018
16RW07		✓	6953785.38	3313988.18	195.48	192.20	4	15-25	Shallow	4/20/2018
16RW08		✓	6953788.82	3314017.82	196.37	193.62	4	16.5-26.5	Shallow	4/19/2018
16RW09		✓	6953821.11	3314045.50	197.81	195.14	4	17-27	Shallow	4/19/2018
16RW10		✓	6953763.40	3314053.06	195.25	192.27	4	15-25	Shallow	4/19/2018
16RW11		✓	6953828.09	3314545.02	189.95	187.46	4	12-22	Shallow	5/3/2018
16RW12		✓	6953887.58	3314501.01	196.22	193.23	4	22-32	Shallow	5/4/2018
16WW48		✓	6953695.43	3314485.33	184.41	181.46	4	10-20	Shallow	10/11/2018
16WW49		✓	6953750.74	3314402.85	190.69	187.66	4	42-52	Intermediate	8/2/2019
16WW51		✓	6953616.52	3314455.29	183.26	180.13	4	31-41	Intermediate	5/3/2018
16WW55		✓	6953802.81	3314115.62	194.03	191.11	4	17-27	Shallow	4/18/2018
16WW56		✓	6953958.38	3314545.68	198.61	195.35	4	21-31	Shallow	11/1/2018
16WW57		✓	6953896.70	3314654.99	177.06	173.12	2	26-36	Intermediate	8/5/2019
16WW58		✓	6953665.15	3314691.22	177.24	173.32	2	28-38	Intermediate	8/7/2019

Notes:

Northing & Easting are based on Texas State Plane coordinate system, North Central Zone (4202), 1983 North American Datum.

Elevations are based on 1988 North American Vertical Datum.

bgs - below ground surface

ft amsl - feet above mean sea level

Table 3-1
Summary of Pre-Remedy Sampling in Shallow Zone

Monitoring Location	Location Description	October 2018									September 2019		
		VOCs (SW8260B) [a]	Perchlorate (314)	Anions (E300.0) [b]	Dissolved Gases (RSK-175) [c]	Alkalinity (2320B)	TOC (SW9060)	DHC (qPCR)	Bromide (E300.0)	Field Parameters [d]	VOCs (SW8260B) [a]	Perchlorate (314)	Field Parameters [d]
16EW02	Inside Mid-Plume ISB Area	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16EW11	Inside Landfill Biobarrier #2								✓	✓			
16EW12B	Inside Landfill Biobarrier #2								✓	✓			
16EW13	Inside Landfill Biobarrier #2								✓	✓			
16EW14B	Inside Landfill Biobarrier #2								✓	✓			
16EW15	Inside Landfill Biobarrier #2								✓	✓			
16WW12	Upgradient to Bayou Biobarrier	✓	✓						✓	✓	✓	✓	✓
16WW14	Upgradient to Landfill Biobarrier #3	✓	✓							✓	✓	✓	✓
16WW16	Upgradient to Landfill Biobarrier #2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW22	Upgradient to Bayou Biobarrier	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW24	Cross-gradient to South of Plume	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW26	Downgradient to Landfill Biobarrier #1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW30	Downgradient of Mid-Plume ISB Area	✓	✓						✓	✓	✓	✓	✓
16WW32	Cross-gradient Outside of Containment Area	✓	✓							✓			
16WW34	Cross-gradient Outside of Containment Area	✓	✓							✓			
16WW36	Downgradient to Landfill Biobarrier #2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW38	Upgradient to Landfill Biobarrier #2	✓	✓							✓			
16WW39	Downgradient of Mid-Plume ISB Area	✓	✓						✓	✓	✓	✓	✓
16WW40	Downgradient to Bayou Biobarrier	✓	✓						✓	✓	✓	✓	✓
16WW42	Downgradient to Landfill Biobarrier #1	✓	✓						✓	✓	✓	✓	✓
16WW43	Cross-gradient to South of Plume	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW44	Background	✓	✓							✓			
16WW46	Downgradient Outside of Contaminated Area	✓	✓							✓			
16WW48	Proposed Well and Downgradient of Mid-Plume ISB Area	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW55	Proposed Well Downgradient to Landfill Biobarrier #3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW56	Proposed Well and Downgradient to Bayou Biobarrier										✓	✓	✓

Notes:

[a] VOCs include TCE; cis-1,2-DCE; 1,1-DCE; 1,2-DCA; 1,1,2-TCA; VC; and methylene chloride.

[b] Anions include nitrate and sulfate.

[c] Dissolved gasses include ethene, ethane, and methane.

[d] Field Parameters include dissolved oxygen, oxidation reduction potential, and pH.

[e] Upper deep monitoring well

✓ Indicates that sample was collected and analyzed for the listed analyte.

DCA - dichloroethane

DCE - dichloroethene

DHC - Dehalococcoides (microbial analysis)

ISB - insitu bioremediation

qPCR - quantitative polymerase chain reaction

TCA - trichloroethane

TOC - total organic carbon

VC - vinyl chloride

VOCs - volatile organic compounds

Table 3-2
Pre-Remedy Results - Shallow Groundwater

		Location Code	16EW02				16EW11		16EW12B		16EW13		16EW14B		16EW15		16WW12				16WW14			
		Sample ID	16EW02-181009		16EW02-190918		16EW11-181013		16EW12B-181013		16EW13-181013		16EW14B-181013		16EW15-181013		16WW12-181012		16WW12-190918		16WW14-181010		16WW14-190916	
		Sample Date	10/9/2018		9/18/2019		10/13/2018		10/13/2018		10/13/2018		10/13/2018		10/13/2018		10/12/2018		9/18/2019		10/10/2018		9/16/2019	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter		Units	MCL/PCL/UTL	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
DHC																									
	Dehalococcoides	cells/mL	NV	0.2	J																				
FIELD TESTS																									
	Dissolved oxygen	mg/L	NV	1.16		1.11		0.28		0.25		1.05		1.14		1.09		0.36		0.34		0.44		0.88	
	Oxidation-Reduction Potential	mV	NV	80.2		171		-79.2		-72.7		-43.2		4.8		-134		130.1		163.3		57.1		24	
	pH	pH units	NV	6.00		6.16		6.31		6.23		5.81		5.72		7.07		5.74		5.79		5.93		6.17	
GASES																									
	Ethane	µg/L	NV	1.16																					
	Ethylene	µg/L	NV	8.81																					
	Methane	µg/L	NV	33.6																					
GEN CHEMISTRY																									
	Alkalinity	mg/L	NV	438																					
	Bromide	mg/L	NV	2.66				4.68		3.82		2.91		1.4		1.86		3.9							
	Nitrate	mg/L	10	< 0.1	U																				
	Sulfate	mg/L	NV	2,130																					
	Total organic carbon	mg/L	NV	10.3																					
PERCHLORATE																									
	Perchlorate	µg/L	17	< 2	U	< 2	U											12		**120**		< 2	U	< 2	U
VOLATILES																									
	1,1,2-Trichloroethane	µg/L	NV	< 25	U	< 12	U											< 5	U	< 2.5	U	< 0.5	U	< 0.5	U
	1,1-Dichloroethene	µg/L	7	**100**		**110**												< 5	U	4.9	J	< 0.5	U	< 0.5	U
	1,2-Dichloroethane	µg/L	5	< 25	U	**51**												**16**		**9.2**		< 0.5	U	< 0.5	U
	cis-1,2-Dichloroethene	µg/L	70	**16,000**		**25,000**												**86**		52		2.6		0.79	J
	Methylene chloride	µg/L	NV	< 50	U	< 25	U											< 10	U	< 5	U	< 1	U	< 1	U
	Trichloroethene	µg/L	5	**24,000**		**42,000**												**4,100**		**2,100**		**42**		**25**	
	Vinyl chloride	µg/L	2	**470**		**650**												**12**		**5.5**		1.1		< 0.5	U

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter
J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected. The analyte was analyzed for, but not detected.
cells/mL - cells per milliliter
DHC - Dehalococcoides
FD - field duplicate
ID - identification
MCL - maximum contaminant limit
mg/L - milligrams per liter
mV - millivolt
NV - no value
PCL - Protective Concentratoin Level
RAWP - Remedial Action Work Plan
REG - regular
UTL - Upper Threshold Limit
Val Qual - validation qualifier
VOCs - volatile organic compounds

Table 3-2
Pre-Remedy Results - Shallow Groundwater

		Location Code	16WW16				16WW22				16WW24		16WW24				16WW26					
		Sample ID	16WW16-181010		16WW16-190916		16WW22-181010		16WW22-190917		16WW24-181009		16WW24-181009-FD		16WW24-190917		16WW26-181009		16WW26-190917		16WW26-190917-FD	
		Sample Date	10/10/2018		9/16/2019		10/10/2018		9/17/2019		10/9/2018		10/9/2018		9/17/2019		10/9/2018		9/17/2019		9/18/2019	
		Sample Purpose	REG		REG		REG		REG		REG		FD		REG		REG		REG		FD	
Parameter		Units	MCL/PCL/UTL	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
DHC																							
	Dehalococcoides	cells/mL	NV	0.5	U			5.2				1.6						0.3	J				
FIELD TESTS																							
	Dissolved oxygen	mg/L	NV	0.96		0.28		0.89		0.23		0.17				0.44		0.66		0.44			
	Oxidation-Reduction Potential	mV	NV	193.6		58.9		68.3		-17.7		282.6				357		50.4		-1.6			
	pH	pH units	NV	6.10		6.12		5.86		6.05		3.54				3.76		5.08		5.21			
GASES																							
	Ethane	µg/L	NV	2.31				< 1	U			0.256	J	0.555	J			0.591	J				
	Ethylene	µg/L	NV	4.98				1.56				1.39	J	1.24				2.59					
	Methane	µg/L	NV	403				2.46				1.65		3.27				10.5					
GEN CHEMISTRY																							
	Alkalinity	mg/L	NV	362				239				< 5	U	< 5	U			12					
	Bromide	mg/L	NV	4.69				4.46				1.26		1.32				< 0.1	U				
	Nitrate	mg/L	10	< 0.1	U			< 0.1	U			< 0.1	U	< 0.1	U			< 0.1	U				
	Sulfate	mg/L	NV	722				772				905		898				1170					
	Total organic carbon	mg/L	NV	4.34				2.62				2.76		2.65				5.03					
PERCHLORATE																							
	Perchlorate	µg/L	17	**420**		**460**		5.5		< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES																							
	1,1,2-Trichloroethane	µg/L	NV	< 25	U	< 12	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2.5	U	< 0.5	U	< 0.5	U
	1,1-Dichloroethene	µg/L	7	< 25	U	**25**		1.9		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2.5	U	1.4		1.6	
	1,2-Dichloroethane	µg/L	5	< 25	U	**19**	J	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2.5	U	< 0.5	U	< 0.5	U
	cis-1,2-Dichloroethene	µg/L	70	**8,500**		**6,600**		19		2.7		< 0.5	U	< 0.5	U	< 0.5	U	**290**		35		36	
	Methylene chloride	µg/L	NV	< 50	U	< 25	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 1	U	< 1	U
	Trichloroethene	µg/L	5	**21,000**		**13,000**		**150**		**34**		< 0.5	U	< 0.5	U	< 0.5	U	**2,400**		**380**		**440**	
	Vinyl chloride	µg/L	2	**330**		**220**		**4.5**		0.44	J	< 0.5	U	< 0.5	U	< 0.5	U	**5**	J	< 0.5	U	< 0.5	U

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter
J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected. The analyte was analyzed for, but not detected.
cells/mL - cells per milliliter
DHC - Dehalococcoides
FD - field duplicate
ID - identification
MCL - maximum contaminant limit
mg/L - milligrams per liter
mV - millivolt
NV - no value
PCL - Protective Concentratoin Level
RAWP - Remedial Action Work Plan
REG - regular
UTL - Upper Threshold Limit
Val Qual - validation qualifier
VOCs - volatile organic compounds

Table 3-2
Pre-Remedy Results - Shallow Groundwater

		Location Code	16WW30				16WW32		16WW34		16WW36				16WW38		16WW39				16WW40				
		Sample ID	16WW30-181012		16WW30-190918		16WW32-181011		16WW34-181010		16WW36-181009		16WW36-190916		16WW38-181010		16WW39-181010		16WW39-190917		16WW40-181012		16WW40-181012-FD		16WW4(
		Sample Date	10/12/2018		9/18/2019		10/11/2018		10/10/2018		10/9/2018		9/16/2019		10/10/2018		10/10/2018		9/17/2019		10/12/2018		10/12/2018		9/17/
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD		RI
Parameter		Units	MCL/PCL/UTL	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
DHC																										
	Dehalococcoides	cells/mL	NV									202														
FIELD TESTS																										
	Dissolved oxygen	mg/L	NV	1.3		0.22		1.94		0.92		0.39		0.21		0.38		0.48		0.23		0.3				2.09
	Oxidation-Reduction Potential	mV	NV	50.1		-54.3		115.4		13.2		116.1		87.4		-44.9		115.9		24.1		-44.1				7.8
	pH	pH units	NV	5.83		6.14		5.64		6.15		6.07		5.98		5.94		5.74		5.97		5.90				5.88
GASES																										
	Ethane	µg/L	NV									< 1	U													
	Ethylene	µg/L	NV									12.3														
	Methane	µg/L	NV									175														
GEN CHEMISTRY																										
	Alkalinity	mg/L	NV									613														
	Bromide	mg/L	NV	3.22								2.7						4.2				5.57		5.72		
	Nitrate	mg/L	10									< 0.2	U													
	Sulfate	mg/L	NV									6290														
	Total organic carbon	mg/L	NV									33														
PERCHLORATE																										
	Perchlorate	µg/L	17	< 2	U	< 2	U	< 2		< 2	U	< 2	U	< 2	U	< 2	U	**120**		**130**		< 2	U	< 2	U	< 2
VOLATILES																										
	1,1,2-Trichloroethane	µg/L	NV	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 25	U	< 12	U	< 5	U	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5
	1,1-Dichloroethene	µg/L	7	< 0.5	U	0.82	J	< 0.5	U	< 0.5	U	**450**		**190**		**21**		< 5	U	2.7		3.5		3.5		3.7
	1,2-Dichloroethane	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**34**	J	**13**	J	< 5	U	< 5	U	2		3.8		3.8		3.8
	cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	**79**		< 0.5	U	< 0.5	U	**66,000**		**19,000**		**240**		**220**		**110**		**220**		**240**		**130**
	Methylene chloride	µg/L	NV	< 1	U	< 1	U	< 1	U	< 1	U	< 50	U	< 25	U	< 10	U	< 10	U	< 1	U	< 1	U	< 1	U	< 1
	Trichloroethene	µg/L	5	1.8		**360**		< 0.5	U	< 0.5	U	**22,000**		**15,000**		**4,400**		**3,900**		**1,200**		**660**		**640**		**740**
	Vinyl chloride	µg/L	2	< 0.5	U	0.41	J	< 0.5	U	< 0.5	U	**610**		**230**		**160**		**15**		**7.1**		**4.5**		**4.2**		**3**

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter
J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected. The analyte was analyzed for, but not detected.
cells/mL - cells per milliliter
DHC - Dehalococcoides
FD - field duplicate
ID - identification
MCL - maximum contaminant limit
mg/L - milligrams per liter
mV - millivolt
NV - no value
PCL - Protective Concentratoin Level
RAWP - Remedial Action Work Plan
REG - regular
UTL - Upper Threshold Limit
Val Qual - validation qualifier
VOCs - volatile organic compounds

Table 3-2
Pre-Remedy Results - Shallow Groundwater

		Location Code		16WW42				16WW43				16WW44		16WW46		16WW48				16WW55				16WW56	
		Sample ID	-190917	16WW42-181012		16WW42-190916		16WW43-181009		16WW43-190917		16WW44-181010		16WW46-181012		16WW48-181018		16WW48-190918		16WW55-181015		16WW55-190917		16WW56-190917	
		Sample Date	2019	10/12/2018		9/16/2019		10/9/2018		9/17/2019		10/10/2018		10/12/2018		10/18/2018		9/18/2019		10/15/2018		9/17/2019		9/17/2019	
		Sample Purpose	EG	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter		Units	MCL/PCL/UTL	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
DHC																										
	Dehalococcoides	cells/mL	NV						2.1								0.3	J			0.5	U				
FIELD TESTS																										
	Dissolved oxygen	mg/L	NV		1.21		1.89		1.46		0.09		1.8		0.49		0.98		0.25		2.08		0.2		0.22	
	Oxidation-Reduction Potential	mV	NV		113.6		-31.4		-1.7		42		53.5		43.9		173.1		124.7		319.9		90.7		33.7	
	pH	pH units	NV		5.27		6.10		6.12		5.92		5.99		6.24		5.75		5.80		6.19		6.17		6.05	
GASES																										
	Ethane	µg/L	NV						< 1	U							0.174	J			0.749	J				
	Ethylene	µg/L	NV						2.28								2.19				3.79					
	Methane	µg/L	NV						133								2.21				136					
GEN CHEMISTRY																										
	Alkalinity	mg/L	NV						104								259				347					
	Bromide	mg/L	NV		0.182				0.173								4.33				2.12					
	Nitrate	mg/L	10						< 0.1	U							< 0.2				< 0.1	U				
	Sulfate	mg/L	NV						6.35								1770				1110					
	Total organic carbon	mg/L	NV						9.46								8.78				7.32					
PERCHLORATE																										
	Perchlorate	µg/L	17	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	14		< 2	U	**400**		**480**		< 2	U
VOLATILES																										
	1,1,2-Trichloroethane	µg/L	NV	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5		< 2.5	U	< 5	U	< 5	U	< 0.5	U
	1,1-Dichloroethene	µg/L	7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**11**		7		< 5	U	**9.1**	J	< 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	**12**		**7**		< 5	U	**5.3**	J	< 0.5	U
	cis-1,2-Dichloroethene	µg/L	70		42		**240**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**2,600**		**1,800**		**540**		**310**		1.7	
	Methylene chloride	µg/L	NV	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1		< 5	U	< 10	U	< 10	U	< 1	U
	Trichloroethene	µg/L	5		**6**		**29**		< 0.5	U	< 0.5	U	< 0.5	U	3		**8,800**		**3,700**		**5,900**		**3,200**		**27**	
	Vinyl chloride	µg/L	2		< 0.5	U	1.1		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	**15**		**7.4**		< 5	U	**37**		0.41	J

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter
J - Estimated. The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
U - Undetected. The analyte was analyzed for, but not detected.
cells/mL - cells per milliliter
DHC - Dehalococcoides
FD - field duplicate
ID - identification
MCL - maximum contaminant limit
mg/L - milligrams per liter
mV - millivolt
NV - no value
PCL - Protective Concentratoin Level
RAWP - Remedial Action Work Plan
REG - regular
UTL - Upper Threshold Limit
Val Qual - validation qualifier
VOCs - volatile organic compounds

Table 3-3
Pre-Remedy Sampling and Analyses in Intermediate and Upper Deep Zones

Monitoring Locations	ISB Area	October 2018									September 2019								
		VOCs (SW8260B) [a]	Perchlorate (314)	Anions (E300.0) [b]	Dissolved Gases (RSK-175) [c]	Alkalinity (2320B)	TOC (SW9060)	DHC (qPCR)	Bromide (E300.0)	Field Parameters [d]	VOCs (SW8260B) [a]	Perchlorate (314)	Anions (E300.0) [b]	Dissolved Gases (RSK-175) [c]	Alkalinity (2320B)	TOC (SW9060)	DHC (qPCR)	Bromide (E300.0)	Field Parameters [d]
16EW05	Inside Mid-Plume ISB Area								✓	✓									
16EW06	Inside Mid-Plume ISB Area	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
16EW07	Inside Mid-Plume ISB Area								✓	✓									
16EW08	Inside Mid-Plume ISB Area								✓	✓									
16WW13	Downgradient of Landfill	✓	✓						✓	✓	✓	✓							✓
16WW21[e]	Upper deep zone; downgradient of Mid-Plume ISB Area	✓	✓						✓	✓									
16WW23	Downgradient of Landfill	✓	✓							✓	✓	✓							✓
16WW25	Upgradient of Mid-Plume ISB Area / Downgradient of Landfill Biobarrier #1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
16WW27	Downgradient Outside of Contaminated Area	✓	✓							✓	✓	✓							✓
16WW29	Downgradient of Mid-Plume ISB Area	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
16WW31	Cross-gradient Outside of Containment Area	✓	✓							✓									
16WW33	Cross-gradient Outside of Containment Area	✓	✓							✓									
16WW35	Upgradient of Mid-Plume ISB Area / Downgradient of Landfill	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
16WW37	Downgradient of Landfill / Upgradient of Landfill	✓	✓							✓									
16WW41	Downgradient of Mid-Plume ISB Area	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓
16WW45	Background	✓	✓							✓									
16WW49	Proposed Well and Downgradient of Mid-Plume ISB Area										✓	✓							✓
16WW51	Proposed Well and Downgradient of Mid-Plume ISB Area										✓	✓							✓
16WW57	Across Harrison Bayou from Bayou Biobarrier										✓	✓	✓	✓	✓	✓	✓	✓	✓
16WW58	Across Harrison Bayou from Bayou Biobarrier										✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes:

[a] VOCs include TCE; cis-1,2-DCE; 1,1-DCE; 1,2-DCA; 1,1,2-TCA; VC; and methylene chloride.

[b] Anions include nitrate and sulfate.

[c] Dissolved gasses include ethene, ethane, and methane.

[d] Field parameters include dissolved oxygen, oxidation reduction potential, and pH.

[e] Upper deep monitoring well. All other wells in this table are in the intermediate zone.

✓ Indicates that sample was collected and analyzed for the listed analyte.

DCE - dichloroethene
DCA - dichloroethane
DHC - Dehalococcoides (microbial analysis)
ISB - in situ bioremediation
qPCR - quantitative polymerase chain reaction
TCA - trichloroethane
TOC - total organic carbon
VC - vinyl chloride
VOCs - volatile organic compounds

Table 3-4
Pre-Remedy Results – Intermediate Groundwater

		Location Code		16EW05		16EW06				16EW07		16EW08		16WW13				16WW21[c]		16WW23			
		Sample ID		16EW05-181011		16EW06-181009		16EW06-190918		16EW07-181013		16EW08-181013		16WW13-181012		16WW13-190918		16WW21-181012		16WW23-181012		16WW23-190917	
		Sample Date		10/11/2018		10/9/2018		9/18/2019		10/13/2018		10/13/2018		10/12/2018		9/18/2019		10/12/2018		10/12/2018		9/17/2019	
		Sample Purpose		REG		REG		REG		REG		REG		REG		REG		REG		REG		REG	
Parameter		Units	MCL/PCL/UTL	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
DHC																							
	Dehalococcoides	cells/mL	NV			1.7																	
FIELD TESTS																							
	Dissolved oxygen	mg/L	NV	0.74		0.95		0.53		1.62		0.48		1.02		0.16		0.82		1.23		0.14	
	Oxidation-Reduction Potential	mV	NV	189.9		59.3		58		-130.9		-16		225.7		190		166.4		13.2		8	
	pH	pH units	NV	6.17		5.84		6.18		7.12		6.23		4.68		5.52		5.52		5.49		6.07	
GASES																							
	Ethane	µg/L	NV			0.31	J																
	Ethylene	µg/L	NV			3.76																	
	Methane	µg/L	NV			8.39																	
GEN CHEMISTRY																							
	Alkalinity	mg/L	NV			438																	
	Bromide	mg/L	NV	3.1		3.38				2.14		1.11		0.929				0.218					
	Nitrate	mg/L	10			< 0.2	U																
	Sulfate	mg/L	NV			6,120																	
	Total organic carbon	mg/L	NV			31																	
PERCHLORATE																							
	Perchlorate	µg/L	17			< 2	U	**42**						< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES																							
	1,1,2-Trichloroethane	µg/L	NV			< 2.5	U	< 12	U					< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
	1,1-Dichloroethene	µg/L	7			**25**		**22**	J					< 5	U	0.7	J	< 0.5	U	< 0.5	U	< 0.5	U
	1,2-Dichloroethane	µg/L	5			4.6	J	< 12	U					< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
	cis-1,2-Dichloroethene	µg/L	70			**3,700**		**3,700**						**1,700**		**210**		< 0.5	U	< 0.5	U	< 0.5	U
	Methylene chloride	µg/L	NV			< 5	U	< 25	U					< 10	U	< 1	U	< 1	U	< 1	U	< 1	U
	Trichloroethene	µg/L	5			**5,500**		**6,500**						**4,400**		**630**		< 0.5	U	< 0.5	U	< 0.5	U
	Vinyl chloride	µg/L	2			**240**		**190**						**51**		**5.6**		< 0.5	U	< 0.5	U	< 0.5	U

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter

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

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

cells/mL - cells per milliliter

DHC - Dehalococcoides

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

mg/L - milligrams per liter

mV - millivolt

NV - no value

PCL - Protective Concentration Level

RAWP - Remedial Action Work Plan

REG - regular sample

UTL - Upper Threshold Limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

Table 3-4
Pre-Remedy Results – Intermediate Groundwater

		Location Code		16WW25						16WW27				16WW29				16WW31				16WW33	
		Sample ID		16WW25-181009		16WW25-190919		16WW25-190919-FD		16WW27-181012		16WW27-190917		16WW29-181015		16WW29-190918		16WW31-181010		16WW31-181010-FD		16WW33-181010	
		Sample Date		10/9/2018		9/19/2019		9/19/2019		10/12/2018		9/17/2019		10/15/2018		9/18/2019		10/10/2018		10/10/2018		10/10/2018	
		Sample Purpose		REG		REG		FD		REG		REG		REG		REG		REG		FD		REG	
Parameter		Units	MCL/PCL/UTL	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
DHC																							
	Dehalococcoides	cells/mL	NV	0.5	U									0.5									
FIELD TESTS																							
	Dissolved oxygen	mg/L	NV	0.31		0.2				0.98		0.04		1.16		0.42		0.71				1.39	
	Oxidation-Reduction Potential	mV	NV	-13.4		-18.2				-11.4		-26		25.1		-39.1		219.1				132.3	
	pH	pH units	NV	5.95		5.68				5.54		5.99		6.19		5.85		5.32				6.49	
GASES																							
	Ethane	µg/L	NV	0.316	J									< 1	U								
	Ethylene	µg/L	NV	0.954	J									1.87									
	Methane	µg/L	NV	13.7										2.41									
GEN CHEMISTRY																							
	Alkalinity	mg/L	NV	69										45.9									
	Bromide	mg/L	NV	2.86										0.218									
	Nitrate	mg/L	10	< 0.1	U									< 0.1	U								
	Sulfate	mg/L	NV	5710										99.2									
	Total organic carbon	mg/L	NV	23.8										1.8									
PERCHLORATE																							
	Perchlorate	µg/L	17	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2		< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES																							
	1,1,2-Trichloroethane	µg/L	NV	< 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-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	< 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	< 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	8.4		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
	Methylene chloride	µg/L	NV	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U	< 1	U
	Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	3.3		2.7		< 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	< 0.5	U	< 0.5	U

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter

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cells/mL - cells per milliliter

DHC - Dehalococcoides

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

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mV - millivolt

NV - no value

PCL - Protective Concentration Level

RAWP - Remedial Action Work Plan

REG - regular sample

UTL - Upper Threshold Limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

Table 3-4
Pre-Remedy Results – Intermediate Groundwater

		Location Code	16WW35				16WW37		16WW41				16WW45		16WW49		16WW51		16WW57		16WW58			
		Sample ID	16WW35-181010		16WW35-190918		16WW37-181010		16WW41-181009		16WW41-190917		16WW45-181010		16WW49-190919		16WW51-190918		16WW57-190918		16WW58-190918		16WW58-190918-FD	
		Sample Date	10/10/2018		9/18/2019		10/10/2018		10/9/2018		9/17/2019		10/10/2018		9/19/2019		9/18/2019		9/18/2019		9/18/2019		9/18/2019	
		Sample Purpose	REG		REG		REG		REG		REG		REG		REG		REG		REG		REG		FD	
Parameter		Units	MCL/PCL/UTL	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
DHC																									
	Dehalococcoides	cells/mL	NV	33.9						0.5	U									35.3		17.8			
FIELD TESTS																									
	Dissolved oxygen	mg/L	NV	0.42		0.26		0.57		0.79		0.27		1.25		0.44		0		0.17		0.16			
	Oxidation-Reduction Potential	mV	NV	158.6		143		48.3		266		109.5		-25		-27.3		-90.8		13.6		-78.1			
	pH	pH units	NV	6.17		6.64		6.73		6.21		6.18		7.05		6.16		6.06		5.69		5.98			
GASES																									
	Ethane	µg/L	NV	0.644	J					0.281	J									0.246	J	0.332	J	0.318	J
	Ethylene	µg/L	NV	4.38						3.04										1.18		1.51		1.43	
	Methane	µg/L	NV	55						6.55										2.44		3.62		4.37	
GEN CHEMISTRY																									
	Alkalinity	mg/L	NV	969						951										133		94		107	
	Bromide	mg/L	NV	< 0.2	U					3.35										3.16		3.52		3.48	
	Nitrate	mg/L	10	< 0.2	U					< 0.2	U									< 0.1	U	< 0.1	U	< 0.1	U
	Sulfate	mg/L	NV	8,400						9,260										2,310		394		396	
	Total organic carbon	mg/L	NV	44						58										10.9		4.21		4.27	
PERCHLORATE																									
	Perchlorate	µg/L	17	**420**		**410**		< 2	U	**60**		< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U	< 2	U
VOLATILES																									
	1,1,2-Trichloroethane	µg/L	NV	< 25	U	< 12	U	< 0.5	U	< 5	U	< 5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U
	1,1-Dichloroethene	µg/L	7	**190**		**120**		< 0.5	U	**17**		**11**		< 0.5	U	< 0.5	U	< 0.5	U	0.56	J	3.9	J	3.9	J
	1,2-Dichloroethane	µg/L	5	< 25	U	< 12	U	< 0.5	U	< 5	U	< 5	U	< 0.5	U	0.86	J	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U
	cis-1,2-Dichloroethene	µg/L	70	**19,000**		**8,800**		5.2		**1,200**		**1,300**		< 0.5	U	**130**		9.1		< 0.5	U	**170**		**180**	
	Methylene chloride	µg/L	NV	< 50	U	< 25	U	< 1	U	< 10	U	< 10	U	< 1	U	< 1	U	< 1	U	< 1	U	< 5	U	< 5	U
	Trichloroethene	µg/L	5	**21,000**		**13,000**		**84**		**9,800**		**3,900**		< 0.5	U	**260**		**90**		**24**		**4,300**		**4,100**	
	Vinyl chloride	µg/L	2	**170**		**75**		< 0.5	U	**110**		**80**		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U	< 2.5	U	< 2.5	U

Notes:

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

[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).

[c] Well 16WW22 is in the Upper Deep groundwater zone, not the Intermediate.

µg/L - micrograms per liter

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

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

cells/mL - cells per milliliter

DHC - Dehalococcoides

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

mg/L - milligrams per liter

mV - millivolt

NV - no value

PCL - Protective Concentration Level

RAWP - Remedial Action Work Plan

REG - regular sample

UTL - Upper Threshold Limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

Table 3-5
Summary of Pre-Remedy Surface Water Sampling

Monitoring Location	Location Description	Analyses			
		VOCs [a] (SW8260B)	Perchlorate (6850)	Metals (6020A/7471B)	Field Parameters [b]
16SW01	Harrison Bayou, downstream of LHAAP-16	✓	✓	✓	✓
16SW02	Harrison Bayou, centered on LHAAP-16 contaminant plumes	✓	✓	✓	✓
16SW03	Harrison Bayou, upstream of LHAAP-16 contaminant plumes	✓	✓	✓	✓

Notes:

[a] VOCs include trichloroethene (TCE); cis-1,2-dichloroethene (DCE); 1,1-DCE; 1,2-dichloroethane (DCA); 1,1,2-trichloroethane (TCA); Vinyl Chloride (VC); and methylene chloride.

[b] Metals include arsenic, chromium, manganese, nickel and thallium.

[c] Field Parameters include dissolved oxygen, oxidation reduction potential, conductivity, temperature and

✓ Indicates that sample was collected and analyzed for the listed analyte.

VOCs - volatile organic compounds

Table 3-6
Pre-Remedy Results – Surface Water

		Location Code	16SW01				16SW02		16SW03	
		Sample ID	16SW01-181011		16SW01-181011-FD		16SW02-181011		16SW03-181011	
		Sample Date	10/11/2018		10/11/2018		10/11/2018		10/11/2018	
		Sample Purpose	REG		FD		REG		REG	
Parameter	Units	MCL/PCL/UTL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Field Tests										
Dissolved oxygen	mg/L	NV	3.74				3.44		4.4	
Oxidation-Reduction Potential	mV	NV	199.2				173.6		185.4	
pH	pH units	NV	6.97				6.67		7.16	
Specific conductivity	µmhos/cm	NV	0.152				0.153		0.149	
Temperature	C	NV	20.84				21.1		21.46	
Metals										
Arsenic	mg/L	0.01	0.00204		0.00212		0.00198	J	0.00194	J
Chromium	mg/L	0.1	0.000499	J	0.000515	J	< 0.001	U	< 0.001	U
Manganese	mg/L	7.8 [b]	0.545		0.586		0.485		0.36	
Nickel	mg/L	0.49 [a]	0.00756		0.00786		0.00725		0.00668	
Thallium	mg/L	0.002	0.000418	J	< 0.001	U	< 0.001	U	< 0.001	U
Perchlorate										
Perchlorate	µg/L	17 [a]	< 2	U	< 2	U	< 2	U	< 2	U
Volatiles										
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	< 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	< 0.5	U	< 0.5	U
Methylene chloride	µg/L	5	< 1	U	< 1	U	< 1	U	< 1	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

Notes:

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

[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).

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

µmhos/cm - micromhos per centimeter

Notes: (cont.)

C - degrees Celsius
DHC - Dehalococcoides
FD - field duplicate
ID - identifier
MCL - maximum contaminant limit
mg/L - milligrams per liter
mV - millivolts
NV - no value
RAWP - Remedial Action Work Plan
REG - regular sample
UTL - Upper Threshold Limit
Val Qual - validation qualifier
VOCs - volatile organic compounds

Table 4-1
In Situ Bioremediation Amendment Mixtures

Area	Total Volume (gal)	Water (gal)	Carbon Source			SDC-9™ (gal)	ZVI (lbs)	Sodium Bromide (lbs)
			Product	Mass (lbs)	Volume (gal)			
Bayou BioBarrier	3,794	3,366	ABC™	3,500	427	1.32	3,500	15.4
Mid Plume Shallow Zone Biogrid	41,627	37,467	EDS-ER™	28,414	4,107	53.10	0	171.6
Mid Plume Intermediate Zone Biobarrier	23,585	21,173	EDS-ER™	16,565	2,394	17.70	0	99.0
Landfill BioBarrier #1	7,241	6,510	EDS-ER™	5,041	729	1.59	0	30.4
Landfill BioBarrier #2	5,302	4,781	EDS-ER™	3,594	520	1.06	0	11.0
Landfill BioBarrier #3	3,377	3,039	EDS-ER™	2,333	337	0.79	0	13.2

Notes:

ABC™ Anaerobic Biochem. This carbon substrate is a proprietary mixture of lactates, fatty acids, alcohols and a phosphate buffer.

EDS-ER™ Electron Donor Solution - Extended Release. This is a carbon substrate that becomes an emulsified vegetable oil when mixed with water.

gal gallons

lbs pounds

SDC-9™ dechlorinating microbial consortium

ZVI zero valent iron

Table 4-2
Injection Volumes

Location	Target Interval (feet bgs)	Start Date	Completion Date	Volume Injected (gallons)	Volume Extracted (gallons)	Volume Recirculated (gallons)
Bayou BioBarrier						
16IW20[1]	14–24	9/24/2019	9/24/2019	271		
DPT-26	22–32	9/26/2019	9/26/2019	271		
DPT-27	22–32	9/26/2019	9/26/2019	271		
DPT-28	22–32	9/25/2019	9/25/2019	271		
DPT-29	22–32	9/25/2019	9/25/2019	271		
DPT-30	22–32	9/25/2019	9/25/2019	271		
DPT-31	22–32	9/25/2019	9/25/2019	271		
DPT-32	18–28	9/25/2019	9/25/2019	271		
DPT-33	18–28	9/25/2019	9/25/2019	271		
DPT-34	18–28	9/25/2019	9/25/2019	271		
DPT-35	18–28	9/24/2019	9/24/2019	271		
DPT-37	14–24	9/24/2019	9/24/2019	271		
DPT-38	14–24	9/24/2019	9/24/2019	271		
DPT-39	14–24	9/24/2019	9/24/2019	271		
Total Injected				**3,794**		
Mid Plume Shallow Zone Biogrid						
DPT-40	14–36	9/30/2019	9/30/2019	1,129		
DPT-41	14–36	9/30/2019	9/30/2019	1,272		
DPT-42	14–36	9/30/2019	9/30/2019	1,127		
DPT-43	14–36	10/1/2019	10/1/2019	1,027		
DPT-44	14–36	9/30/2019	9/30/2019	1,127		
DPT-45	14–36	10/1/2019	10/1/2019	1,027		
DPT-46	14–36	10/3/2019	10/3/2019	1,027		
DPT-47	14–36	10/1/2019	10/2/2019	1,027		
DPT-48	14–36	10/2/2019	10/2/2019	1,027		
DPT-49	14–36	10/4/2019	10/4/2019	1,027		
DPT-50	14–36	10/2/2019	10/2/2019	1,027		
DPT-51	14–36	10/1/2019	10/2/2019	1,027		
DPT-52	14–36	10/3/2019	10/4/2019	1,027		
DPT-53	14–36	10/1/2019	10/1/2019	1,027		
DPT-54	14–36	10/5/2019	10/6/2019	1,027		
DPT-55	14–36	10/3/2019	10/4/2019	1,027		
DPT-56	14–36	10/2/2019	10/3/2019	1,027		
DPT-57	14–36	10/3/2019	10/3/2019	1,027		
DPT-58	14–36	10/1/2019	10/2/2019	1,027		
DPT-59	14–36	10/2/2019	10/3/2019	1,027		
DPT-60	14–36	10/10/2019	10/10/2019	1,027		
DPT-61	14–36	10/10/2019	10/10/2019	1,027		
DPT-62	14–36	10/10/2019	10/11/2019	1,027		
DPT-63	14–36	10/8/2019	10/10/2019	1,027		

Table 4-2
Injection Volumes

Location	Target Interval (feet bgs)	Start Date	Completion Date	Volume Injected (gallons)	Volume Extracted (gallons)	Volume Recirculated (gallons)
DPT-64	14–36	10/5/2019	10/6/2019	1,027		
DPT-65	14–36	10/8/2019	10/8/2019	1,027		
DPT-66	14–36	10/7/2019	10/7/2019	1,027		
DPT-67	14–36	10/6/2019	10/6/2019	1,027		
DPT-68	14–36	10/4/2019	10/5/2019	1,027		
DPT-69	14–36	10/3/2019	10/4/2019	1,027		
DPT-70	14–36	10/5/2019	10/6/2019	1,027		
DPT-71	14–36	10/6/2019	10/7/2019	1,027		
DPT-72	14–36	10/7/2019	10/8/2019	1,027		
DPT-73	14–36	10/8/2019	10/10/2019	1,027		
DPT-74	14–36	10/10/2019	10/10/2019	1,027		
DPT-75	14–36	10/10/2019	10/11/2019	1,027		
DPT-76	14–36	10/4/2019	10/4/2019	1,027		
DPT-77	14–36	10/5/2019	10/6/2019	1,027		
DPT-78	14–36	10/6/2019	10/7/2019	1,027		
DPT-79	14–36	10/7/2019	10/8/2019	1,027		
Total Injected				**41,627**		
Mid Plume Intermediate Zone Biobarrier						
16EW05	47–52	11/16/2019	11/22/2019	2,395		
16EW06	50–55	11/16/2019	11/22/2019	2,394		
16EW07	41–46	11/16/2019	11/22/2019	2,394		
16EW08	34-39	11/16/2019	11/22/2019	2,394		
16IW25	40-55	9/27/2019	9/29/2019	2,394		
16IW26	40-55	9/27/2019	9/29/2019	2,394		
16IW27/16TIP27	40-55	9/27/2019	10/9/2019	2,394		
16IW28/16TIP28	35-50	9/27/2019	10/14/2019	2,394		
16IW29	35-50	9/27/2019	9/29/2019	2,395		
16IW30	35-50	9/27/2019	10/1/2019	2,038		
Total				**23,585**		
16EW05	47–52	10/17/2019	11/14/2019		112,320	
16EW06	50–55	10/17/2019	11/14/2019			
16EW07	41–46	10/17/2019	11/14/2019			
16EW08	34–39	10/17/2019	11/14/2019			
Total Extracted					**112,320**	
16IW25	40–55	10/18/2019	11/14/2019			112,320
16IW26	40–55	10/18/2019	11/14/2019			
16IW29	35–50	10/18/2019	11/14/2019			
16IW30	35–50	10/18/2019	11/14/2019			
Total Recirculated						**112,320**
Landfill BioBarrier #1						
DPT 01	15–21	10/16/2019	10/16/2019	291		

Table 4-2
Injection Volumes

Location	Target Interval (feet bgs)	Start Date	Completion Date	Volume Injected (gallons)	Volume Extracted (gallons)	Volume Recirculated (gallons)
DPT 02	15–21	10/15/2019	10/16/2019	291		
DPT 03	15–21	10/16/2019	10/16/2019	291		
DPT 04	15–21	10/15/2019	10/16/2019	291		
DPT 05	15–21	10/16/2019	10/16/2019	291		
DPT 06	15–21	10/16/2019	10/16/2019	291		
DPT 07	15–21	10/15/2019	10/16/2019	291		
DPT 08	13–18	10/16/2019	10/16/2019	234		
DPT 09	13–18	10/16/2019	10/16/2019	234		
DPT 10	13–18	10/16/2019	10/16/2019	234		
DPT 11	13–18	10/10/2019	10/10/2019	234		
DPT 12	13–18	10/16/2019	10/16/2019	234		
DPT 13	5–18	10/16/2019	10/16/2019	632		
DPT 14	5–18	10/17/2019	10/18/2019	632		
DPT 15	5–18	10/16/2019	10/18/2019	632		
DPT 16	5–18	10/17/2010	10/17/2010	632		
DPT 17	5–18	10/16/2010	10/17/2010	632		
DPT 18	5–18	10/17/2010	10/17/2010	632		
16IW09	13–18	10/17/2010	10/17/2010	242		
Total Injected				**7,241**		
Landfill BioBarrier #2						
16EW11	15.2–24.8	12/20/2019	12/21/2019	540		
16EW12B	13–18	12/20/2019	12/20/2019	540		
16EW13	15–24.6	12/20/2019	12/20/2019	540		
16EW14B	14–29	12/20/2019	12/20/2019	540		
16EW15	13.9–23.5	12/20/2019	12/21/2019	540		
16IW01	15–25	12/3/2019	12/4/2019	650		
16IW03	15–25	12/3/2019	12/4/2019	651		
16IW05	15–25	12/3/2019	12/4/2019	651		
16IW07	14–24	12/3/2019	12/4/2019	651		
Total Injected				**5,302**		
16EW11	15.2–24.8	12/3/2019	12/18/2019			
16EW12B	13–28	12/3/2019	12/18/2019			
16EW13	15–24.6	12/3/2019	12/18/2019		21,438	
16EW14B	14–29	12/3/2019	12/18/2019			
16EW15	13.9–23.5	12/3/2019	12/18/2019			
Total Extracted					**21,438**	
16IW01	15–25	12/11/2019	12/19/2019			4,618
16IW03	15–25	12/11/2019	12/19/2019			4,712
16IW05	15–25	12/11/2019	12/19/2019			4,983
16IW07	14–24	12/11/2019	12/19/2019			4,718
Total Recirculated						19,030

Table 4-2
Injection Volumes

Location	Target Interval (feet bgs)	Start Date	Completion Date	Volume Injected (gallons)	Volume Extracted (gallons)	Volume Recirculated (gallons)
Landfill BioBarrier #3						
DPT 19	17–27	10/19/2019	10/19/2019	421		
DPT 20	17–27	10/19/2019	10/19/2019	421		
DPT 21	17–27	10/19/2019	10/19/2019	424		
DPT 22	17–27	10/19/2019	10/19/2019	424		
DPT 23	15–25	10/19/2019	10/19/2019	423		
DPT 24	15–25	10/19/2019	10/19/2019	422		
DPT 25	15–25	10/19/2019	10/19/2019	421		
16IW10	15–25	10/19/2019	10/19/2019	422		
Total Injected				**3,377**		

Notes:

[1] 16IW20 is sometimes labeled as DPT-36. However, it is a permanent injection well, not a direct push point.

bgs below ground surface

Table 4-3
Harrison Bayou Observations

Date	Time	Dissolved Oxygen (mg/L)	Comments	Reason for Observation
9/24/2019	8:50	2.85	First Injections started at 10:45	Reading prior to start of injections.
9/24/2019	12:45	3.19	No visible product in creek	Observations while injections were in progress at Bayou Biobarrier
9/24/2019	13:45	3.41	No visible product in creek	
9/24/2019	14:47	3.47	No visible product in creek	
9/24/2019	16:45	3.21	No visible product in creek	
9/25/2019	7:27	2.75	No visible product in creek	
9/25/2019	9:30	3.32	No visible product in creek	
9/25/2019	10:30	3.33	No visible product in creek	
9/25/2019	11:35	3.67	No visible product in creek	
9/25/2019	12:30	3.68	No visible product in creek	
9/25/2019	13:50	3.85	No visible product in creek	
9/25/2019	14:50	5.63	No visible product in creek	
9/25/2019	15:50	5.06	No visible product in creek	
9/26/2019	7:28	2.93	No visible product in creek	
9/26/2019	9:30	2.95	Finished Injection at 10:00	
9/26/2019	10:30	3.92	No visible product in creek	Daily observations for one week after injections.
9/27/2019	8:00	2.97	No visible product in creek	
9/28/2019	7:20	2.74	No visible product in creek	
9/29/2019	7:45	2.77	No visible product in creek	
9/30/2019	9:00	3.72	No visible product in creek	
10/1/2019	12:31	4.68	No visible product in creek	
10/2/2019	9:53	3.59	No visible product in creek	
10/3/2019	7:10	2.60	No visible product in creek	
10/22/2019	–	6	No visible product in creek	Extra observations.
11/4/2019	–	6.56	No visible product in creek	

Note:
mg/L - milligrams per liter

Table 4-4
TOC and Bromide During Implementation of Landfill Biobarrier #2

Bromide (SW9056) (mg/L)							
	Sample Date						
Well ID	Pre-remedy 10/13/2018	12/4/2019	12/5/2019	12/6/2019	12/9/2019	12/12/2019	12/18/2019
16EW11	4.68	4.12	4	3.91	3.77	3.92	4.58
16EW12B	3.82	3.32	3.43	2.6	2.93	2.94	2.93
16EW13	2.91	2.28	2.33	2.35	2.23	2.53	2.52
16EW14B	1.4	1.4	1.43	1.37	1.48	1.43	1.65
16EW15	1.86	1.54	1.59	1.52	1.53	1.48	1.59

Total Organic Carbon (SM5310) (mg/L)							
	Sample Date						
Well ID	Pre-remedy 10/13/2018	12/4/2019	12/5/2019	12/6/2019	12/9/2019	12/12/2019	12/18/2019
16EW11	6.36	7.02	8.32	93.4	13.5	11.2	15.6
16EW12B	9.15	9.24	38.2	12.7	11.2	11.8	13.8
16EW13	9.85	8.5	9.09	9.21	9.54	10.2	23.9
16EW14B	21.6	21	21	20.7	22.6	21	22.1
16EW15	21	27.7	30.8	30.3	26.1	27.4	26.7

Notes:

Amendments were injected, extracted, and/or recirculated at Landfill Biobarrier #2 between December 3–21, 2019.

SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater, 2017.*

SW9056 Test Method 9056A, SW-846, 2007.

ID identifier

mg/L milligrams per liter

TOC total organic carbon

Table 4-5
TOC and Bromide During Implementation of Mid-Plume Intermediate Biobarrier

Bromide (SW9056) (mg/L)

	Sample Date										
	Pre-remedy										
Well ID	10/9/2018	10/11/2018	10/13/2018	10/18/2019	10/22/2019	10/25/2019	10/31/2019	11/5/2019	11/6/2019	11/8/2019	11/11/2019
16EW05		3.1		3.92		1.93		2.82			2.78
16EW06	3.38				2.99		2.06			4.6 J	
16EW07			2.14	1.37		2.79		2.96			
16EW08			1.11		20.6				41.8		

Total Organic Carbon (SM5310) (mg/L)

	Sample Date					
	Pre-remedy					
Well ID	10/9/2018	10/31/2019	11/5/2019	11/6/2019	11/8/2019	11/11/2019
16EW05		30.6	21.1			31
16EW06	31	27			28.1	
16EW07		21	32.6			
16EW08				64		

Notes:

Amendments were injected, extracted, and or recirculated at the intermediate zone of the mid-plume area between 9/27/2019 and 11/22/2019.

SM5310 - Method 5310, *Standard Methods For the Examination of Water and Wastewater, 2017.*

SW9056 - Test Method 9056A, SW-846, 2007.

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

ID - identification

mg/L - milligrams per liter

TOC - total organic carbon

Table 5-1
Design Effectiveness Results at Bayou Biobarrier

	Location Code	16IW20				16RW11		16RW12					
	Sample ID	16IW20-191022		16IW20-200309		16RW11-191022		16RW12-191022		16RW12-191022-FD		16RW12-200310	
	Sample Date	10/22/2019		3/9/2020		10/22/2019		10/22/2019		10/22/2019		3/10/2020	
	Location Description	Shallow; Bayou Biobarrier Area		Shallow; Bayou Biobarrier Area		Shallow; Within Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.04		2.6		0.07		0.88				1.34	
ORP (field reading)	mV	-182		-230		-39		159				7	
pH (field reading)	pH units	6.07		6.49		5.27		6.12				6.65	
Bromide (SW9056)	mg/L	4.09		13.4		213		3.85		3.9		4.3	
Total organic carbon (SM5310)	mg/L	38		10.7		3290		1.78		1.91		2.56	

	Location Code	16WW12						16WW22					
	Sample ID	16WW12-181012		16WW12-190918		16WW12-191022		16WW22-181010		16WW22-190917		16WW22-191022	
	Sample Date	10/12/2018		9/18/2019		10/22/2019		10/10/2018		9/17/2019		10/22/2019	
	Location Description	Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient 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
Dissolved oxygen (field reading)	mg/L	0.36		0.34		0.05		0.89		0.23		0.52	
ORP (field reading)	mV	130.1		163.3		-37		68.3		-17.7		29	
pH (field reading)	pH units	5.74		5.79		6.02		5.86		6.05		6.30	
Bromide (SW9056)	mg/L	3.9				3.56		4.46				3.5	
Total organic carbon (SM5310)	mg/L					7.51		2.62				1.84	

	Location Code	16WW39						16WW40									
	Sample ID	16WW39-181010		16WW39-190917		16WW39-191022		16WW40-181012		16WW40-181012-FD		16WW40-190917		16WW40-191022		16WW40-200310	
	Sample Date	10/10/2018		9/17/2019		10/22/2019		10/12/2018		10/12/2018		9/17/2019		10/22/2019		3/10/2020	
	Location Description	Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient of Bayou Biobarrier		Shallow; Upgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient of Bayou Biobarrier		Shallow; Downgradient 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	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.48		0.23		0.2		0.3				2.09		0.03		0.06	
ORP (field reading)	mV	115.9		24.1		57		-44.1				7.8		-56		78	
pH (field reading)	pH units	5.74		5.97		6.14		5.90				5.88		5.95		6.30	
Bromide (SW9056)	mg/L	4.2				4.96		5.57		5.72				4.49		4.2	
Total organic carbon (SM5310)	mg/L					3.53								7.72		9.79	

Notes:
Amendments were injected at the Bayou Biobarrier between 9/24/2019 and 9/26/2019.
Shading indicates samples that were collected prior to the injections.
SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater* . 2017.
SW9056 Test Method 9056A, SW-846, 2007.
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 - identifier
ISB - in situ bioremediation
mg/L - milligrams per liter
mV - millivolts
ORP - oxidation-reduction potential
Val Qual - validation qualifier

Table 5-2
Design Effectiveness Results at Mid-Plume Shallow Zone Biogrid

	Location Code	16EW01				16EW02							
	Sample ID	16EW01-191111		16EW01-200309		16EW02-181009		16EW02-190918		16EW02-191111		16EW02-200309	
	Sample Date	11/11/2019		3/9/2020		10/9/2018		9/18/2019		11/11/2019		3/9/2020	
	Location Description	Shallow; Inside Mid-Plume ISB Area		Shallow; Inside Mid-Plume ISB Area		Shallow; Inside Mid-Plume ISB Area		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	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.55		4.68		1.16		1.11		0.95		3.77	
ORP (field reading)	mV	-23.9		-79		80.2		171		70.9		55	
pH (field reading)	pH units	6.12		6.36		6.00		6.16		5.95		6.86	
Bromide (SW9056)	mg/L	3.33		3.39		2.66				1.74		2.06	
Total organic carbon (SM5310)	mg/L	9.06		13.4		10.3				10.3		6.48	

	Location Code	16EW03		16EW04					
	Sample ID	16EW03-191111		16EW04-191111		16EW04-191111-FD		16EW04-200309	
	Sample Date	11/11/2019		11/11/2019		11/11/2019		3/9/2020	
	Location Description	Shallow; Inside Mid-Plume ISB Area		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	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.39		0.57				2.78	
ORP (field reading)	mV	-110.1		128.3				65	
pH (field reading)	pH units	6.21		5.46				7.26	
Bromide (SW9056)	mg/L	5.3		2.48		2.54		0.637	
Total organic carbon (SM5310)	mg/L	22.6		13.6		15.3		3.4	

Notes:
Amendments were injected into the shallow groundwater zone in the mid-plume area between 9/30/2019 and 10/11/2019.
Shading indicates samples that were collected prior to the injections.
SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewate*r. 2017.
SW9056 Test Method 9056A, SW-846. 2007.
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 identifier
ISB in situ bioremediation
mg/L milligrams per liter
mV millivolts
ORP oxidation-reduction potential
Val Qual validation qualifier

Table 5-3

Design Effectiveness Results at Mid-Plume Intermediate Zone Biobarrier

	Location Code	16EW05													
	Sample ID	16EW05-181011		16EW05-191018		16EW05-191025		16EW05-EVENT2-191031		16EW05-191105		16EW05-191111		16EW05-E2-191223	
	Sample Date	10/11/2018		10/18/2019		10/25/2019		10/31/2019		11/5/2019		11/11/2019		12/23/2019	
	Location Description	Intermediate; 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		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	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.74												0.07	
ORP (field reading)	mV	189.9												-29	
pH (field reading)	pH units	6.17												5.33	
Bromide (SW9056)	mg/L	3.1		3.92		1.93				2.82		2.78		350	
Total organic carbon (SM5310)	mg/L							30.6		21.1		31		22,900	

	Location Code	16EW06													
	Sample ID	16EW06-181009		16EW06-190918		16EW06-191022		16EW06-EVENT2-191031		16EW06-191108		16EW06-E2-191223		16EW06-E2-191223-FD	
	Sample Date	10/9/2018		9/18/2019		10/22/2019		10/31/2019		11/8/2019		12/23/2019		12/23/2019	
	Location Description	Intermediate; 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		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	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.95		0.53								0.04			
ORP (field reading)	mV	59.3		58								-33			
pH (field reading)	pH units	5.84		6.18								5.25			
Bromide (SW9056)	mg/L	3.38				2.99		2.06		4.6	J	521		539	
Total organic carbon (SM5310)	mg/L	31						27		28.1		144,000		137,000	

	Location Code	16EW07											
	Sample ID	16EW07-181013		16EW07-191018		16EW07-191025		16EW07-EVENT2-191031		16EW07-191105		16EW07-E2-191223	
	Sample Date	10/13/2018		10/18/2019		10/25/2019		10/31/2019		11/5/2019		12/23/2019	
	Location Description	Intermediate; 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		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
Dissolved oxygen (field reading)	mg/L	1.62										0.02	
ORP (field reading)	mV	-130.9										-18	
pH (field reading)	pH units	7.12										5.19	
Bromide (SW9056)	mg/L	2.14		1.37		2.79				2.96		357	
Total organic carbon (SM5310)	mg/L							21		32.6		48,000	

	Location Code	16EW08							
	Sample ID	16EW08-181013		16EW08-191022		16EW08-191106		16EW08-E2-191223	
	Sample Date	10/13/2018		10/22/2019		11/6/2019		12/23/2019	
	Location Description	Intermediate; Inside Mid-plume ISB Area		Intermediate; Inside Mid-plume ISB Area		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
Dissolved oxygen (field reading)	mg/L	0.48						0.09	
ORP (field reading)	mV	-16						-7	
pH (field reading)	pH units	6.23						5.20	
Bromide (SW9056)	mg/L	1.11		20.6		41.8		379	
Total organic carbon (SM5310)	mg/L					64		38,000	

Notes:

Amendments were injected into the intermediate zone of the mid-plume area between September 27 and November 22, 2019.

Shading indicates samples that were collected prior to the injections.

SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater* . 2017.

SW9056 Test Method 9056A, SW-846. 2007.

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 identifier

ISB in situ bioremediation

mg/L milligrams per liter

mV millivolts

ORP oxidation-reduction potential

Val Qual validation qualifier

Table 5-4
Design Effectiveness Results at Landfill Biobarrier #1

	Location Code	16IW09		16RW01		16RW02		16RW03				16RW04					
	Sample ID	16IW09-191119		16RW01-191119		16RW02-191119		16RW03-191119		16RW03-200309		16RW04-191119		16RW04-191119-FD		16RW04-200309	
	Sample Date	11/19/2019		11/19/2019		11/19/2019		11/19/2019		3/9/2020		11/19/2019		11/19/2019		3/9/2020	
	Location Description	Shallow; Landfill Biobarrier #1 Area		Shallow; Upgradient of Landfill Biobarrier #1		Shallow; Upgradient of Landfill Biobarrier #1		Shallow; Within Landfill Biobarrier #1		Shallow; Within Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient 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	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.04		0.19		0.03		0.49		0.32		0.12				0.2	
ORP (field reading)	mV	-88		303		-15		85		199		228				250	
pH (field reading)	pH units	4.6		4.93		5.73		5.74		5.62		5.01				5.07	
Bromide (SW9056)	mg/L	70.7		0.52		0.13		0.713		0.792		0.66		0.656		0.43	
Total organic carbon (SM5310)	mg/L	7820		3.66		4.37	J	2.51	J	1.04		2.81		2.8		3.17	

	Location Code	16RW05		16WW26							
	Sample ID	16RW05-191119		16WW26-181009		16WW26-190917		16WW26-191119		16WW26-200309	
	Sample Date	11/19/2019		10/9/2018		9/17/2019		11/19/2019		3/9/2020	
	Location Description	Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1		Shallow; Downgradient of Landfill Biobarrier #1	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.05		0.66		0.44		0.18		0.07	
ORP (field reading)	mV	-178		50.4		-1.6		95		266	
pH (field reading)	pH units	6.16		5.08		5.21		5.29		4.72	
Bromide (SW9056)	mg/L	75.4		0.1	U			0.262		0.258	
Total organic carbon (SM5310)	mg/L	791		5.03				2.38		2.27	

	Location Code	16WW42									
	Sample ID	16WW42-181012		16WW42-190916		16WW42-191119		16WW42-200310		16WW42-200310-FD	
	Sample Date	10/12/2018		9/16/2019		11/19/2019		3/10/2020		3/10/2020	
	Location Description	Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	1.21		1.89		1.37		1.52			
ORP (field reading)	mV	113.6		-31.4		48		241			
pH (field reading)	pH units	5.27		6.10		5.58		5.15			
Bromide (SW9056)	mg/L	0.182				0.662		1.36		1.35	
Total organic carbon (SM5310)	mg/L					3.94		1.73		1.68	

Notes:
Amendments were injected at Landfill Biobarrier #1 between October 15–18, 2019.
Shading indicates samples that were collected prior to the injections.
SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater* . 2017.
SW9056 Test Method 9056A, SW-846. 2007.
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
ISB in situ bioremediation
mg/L milligrams per liter
mV millivolts
ORP oxidation-reduction potential
Val Qual validation qualifier

Table 5-5
Design Effectiveness Results at Landfill Biobarrier #2

	Location Code	16IW03		16IW04				16PM02		16PM03	
	Sample ID	16IW03-200123		16IW04-200123		16IW04-200310		16PM02-200123		16PM03-200123	
	Sample Date	1/23/2020		1/23/2020		3/10/2020		1/23/2020		1/23/2020	
	Location Description	Shallow, Injection Well, Within Landfill		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.04		0.06		0.06		0.08		0.02	
ORP (field reading)	mV	-78		-37		-79		53		18	
pH (field reading)	pH units	7.25		7.0		6.56		7.15		7.06	
Bromide (SW9056)	mg/L	0.66		4.68		4.82		0.774		4.55	
Total organic carbon (SM5310)	mg/L	222		6.7		7.68		6.58		4.88	

	Location Code	16PM06						16PM09			
	Sample ID	16PM06-200123		16PM06-200123-FD		16PM06-200310		16PM09-200123		16PM09-200310	
	Sample Date	1/23/2020		1/23/2020		3/10/2020		1/23/2020		3/10/2020	
	Location Description	Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.08				0.09		0.03		0.64	
ORP (field reading)	mV	-21				-53		175		75	
pH (field reading)	pH units	6.85				6.21		6.73		6.36	
Bromide (SW9056)	mg/L	2.74		2.74		2.26		0.744		0.266	
Total organic carbon (SM5310)	mg/L	9.03		9.01		8		7.58		3.33	

	Location Code	16PM14				16WW36							
	Sample ID	16PM14-200123		16PM14-200310		16WW36-181009		16WW36-190916		16WW36-200123		16WW36-200311	
	Sample Date	1/23/2020		3/10/2020		10/9/2018		9/16/2019		1/23/2020		3/11/2020	
	Location Description	Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,		Shallow, Performance Well,	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.04		0.08		0.39		0.21		0.07			
ORP (field reading)	mV	6		88		116.1		87.4		152			
pH (field reading)	pH units	6.81		6.36		6.07		5.98		7.14			
Bromide (SW9056)	mg/L	2.99		2.65		2.7				1.4		0.91	
Total organic carbon (SM5310)	mg/L	10.4		10.5		33				21	J	19.7	

Notes:

Amendments were injected, extracted, and/or recirculated at Landfill Biobarrier #2 between December 3–21, 2019.

Shading indicates samples that were collected prior to the injections.

SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater*. 2017.

SW9056 Test Method 9056A, SW-846. 2007.

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

ISB in situ bioremediation

mg/L milligrams per liter

mV millivolts

ORP oxidation-reduction potential

Val Qual validation qualifier

Table 5-6
Design Effectiveness Results at Landfill Biobarrier #3

	Location Code	16IW10		16RW06				16RW07		16RW08			
	Sample ID	16IW10-191120		16RW06-191120		16RW06-191120-FD		16RW07-191120		16RW08-191120		16RW08-200311	
	Sample Date	11/20/2019		11/20/2019		11/20/2019		11/20/2019		11/20/2019		3/11/2020	
	Location Description	Shallow; Landfill Biobarrier #3 Area		Shallow; Upgradient of Landfill Biobarrier #3		Shallow; Upgradient of Landfill Biobarrier #3		Shallow; Upgradient of Landfill Biobarrier #3		Shallow; Within Landfill Biobarrier #3		Shallow; Within Landfill Biobarrier #3	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.05		0.06				0.03		0.04		0.67	
ORP (field reading)	mV	-47		140				43		90		28	
pH (field reading)	pH units	6.2		6.02				6.14		6.35		6.76	
Bromide (SW9056)	mg/L	201		5.03		5.05		4.25		6.06		5.1	
Total organic carbon (SM5310)	mg/L	1850		1.54		1.55		1.59		2.02		2.6	

	Location Code	16RW09				16RW10			
	Sample ID	16RW09-191120		16RW09-200311		16RW10-191120		16RW10-200311	
	Sample Date	11/20/2019		3/11/2020		11/20/2019		3/11/2020	
	Location Description	Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3		Shallow; Downgradient of Landfill Biobarrier #3	
Parameter	Units	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
Dissolved oxygen (field reading)	mg/L	0.21		0.04		0.03		0.86	
ORP (field reading)	mV	124		53		85		50	
pH (field reading)	pH units	6.17		6.69		6.26		6.64	
Bromide (SW9056)	mg/L	4.53		4.86		3.99		3.33	
Total organic carbon (SM5310)	mg/L	1.99		2.56		4.08		4.08	

Notes:

Amendments were injected at Landfill Biobarrier #3 on October 19, 2019.

SM5310 Method 5310, *Standard Methods For the Examination of Water and Wastewater. 2017.*

SW9056 Test Method 9056A, SW-846. 2007.

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

ISB in situ bioremediation

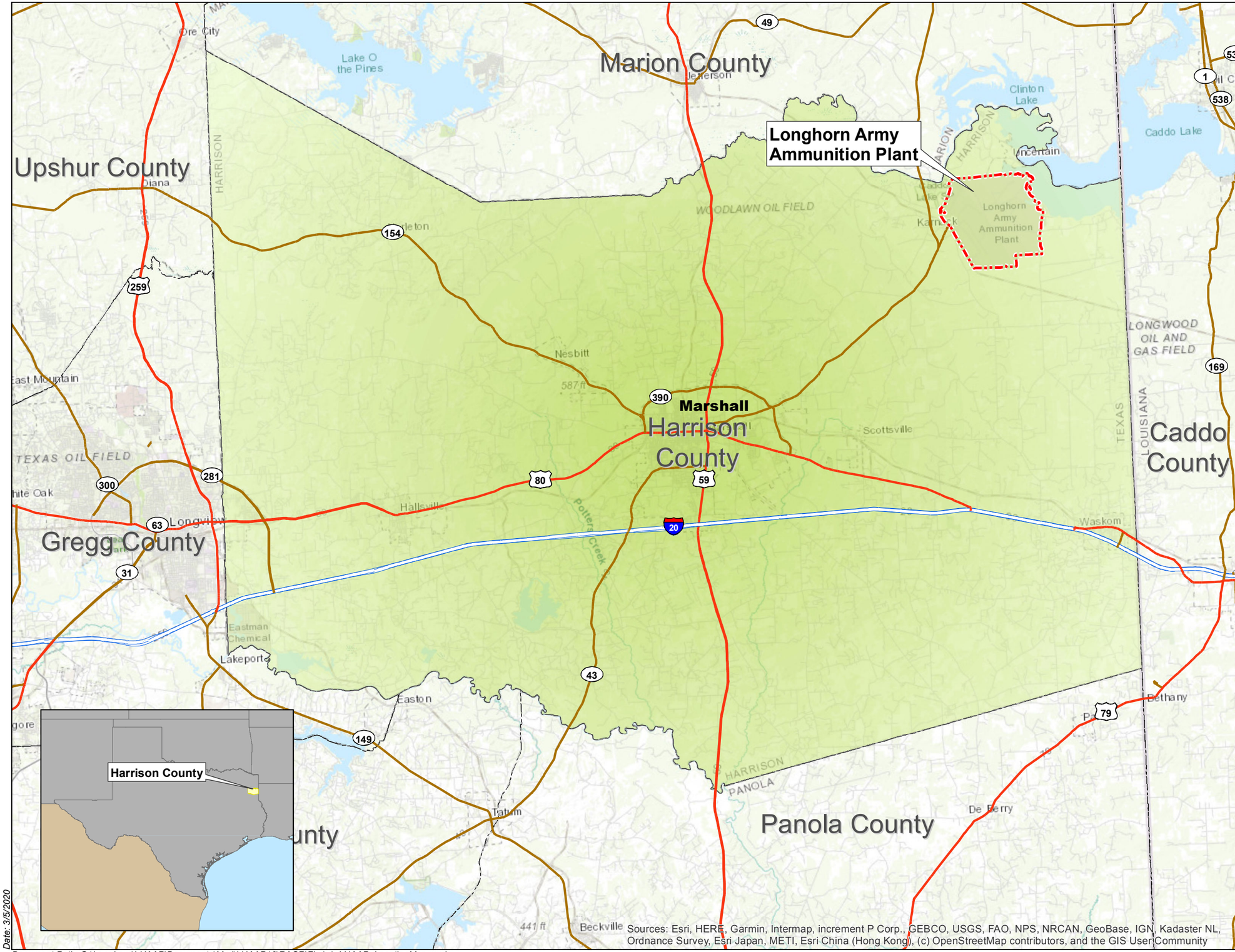
mg/L milligrams per liter

mV millivolts

ORP oxidation-reduction potential

Val Qual validation qualifier

Figures



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

N

0 2 4 Miles

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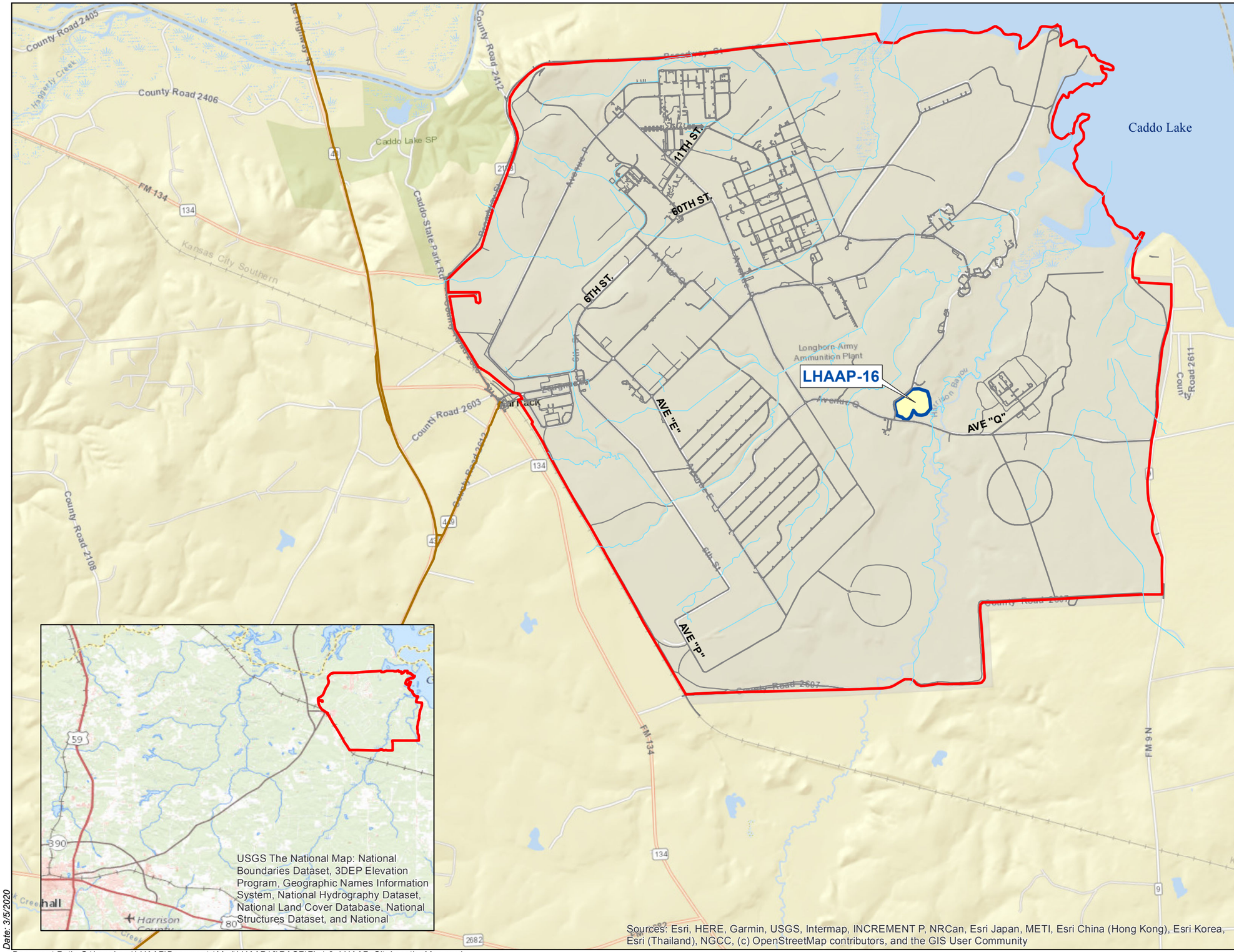
Figure 1-1

LHAAP Location Map
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 3/5/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-1_LHAAP_LocationMap.mxd



Stream
Road
LHAAP Boundary
LHAAP-16 Site Boundary

N

0 1,500 3,000 Feet

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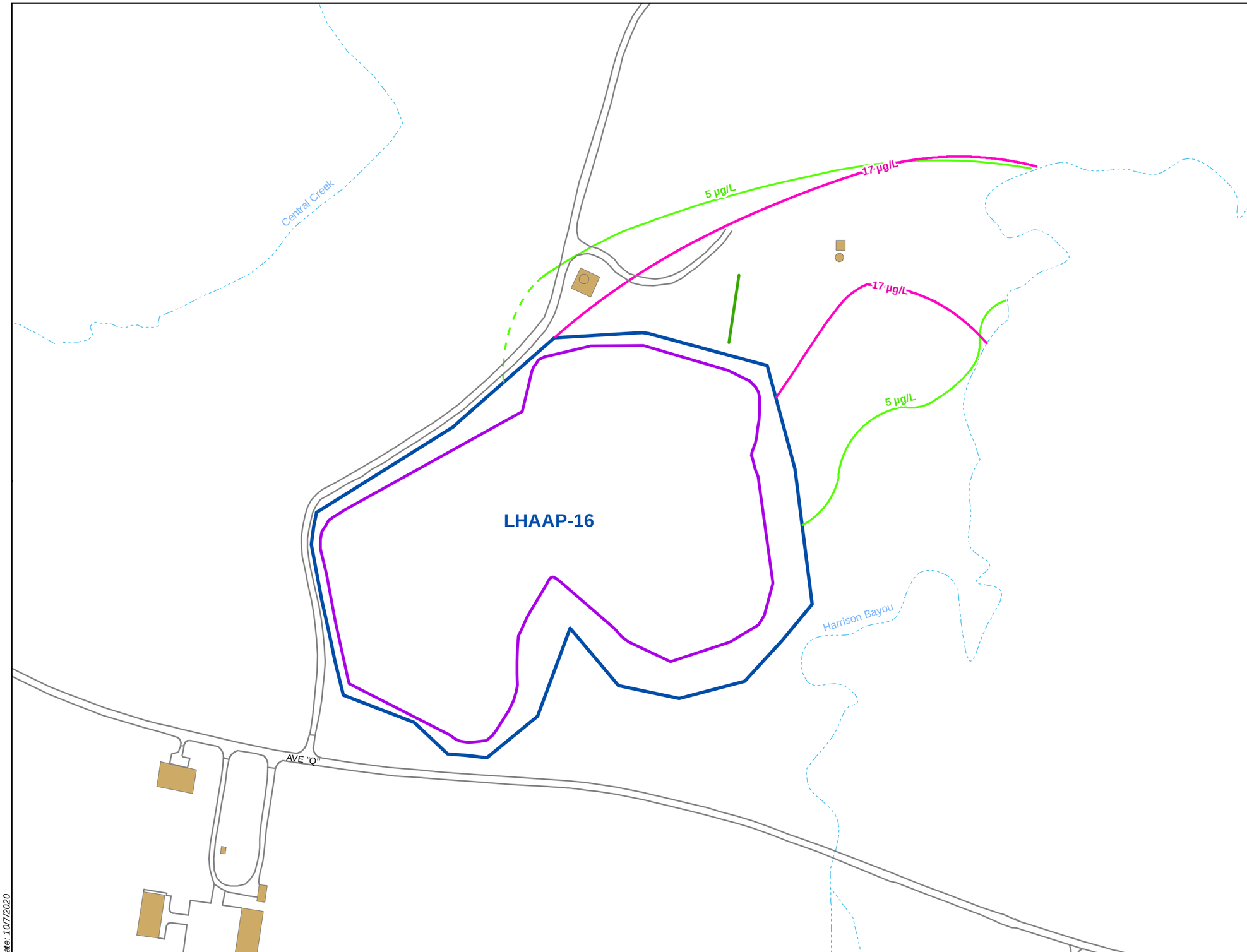
Figure 1-2

LHAAP Site Location Map
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 3/5/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-2_LHAAP_SiteLocationMap.mxd



Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (May 2013)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)

Location of Semi-Passive Biobarrier Demonstration (February 2004 through June 2006 [Geosyntec 2009])

Stream

Road

Approximate Limits of Od Landfill

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. µg/L - micrograms per liter
2. TCE - trichloroethene

N

0 110 220 Feet

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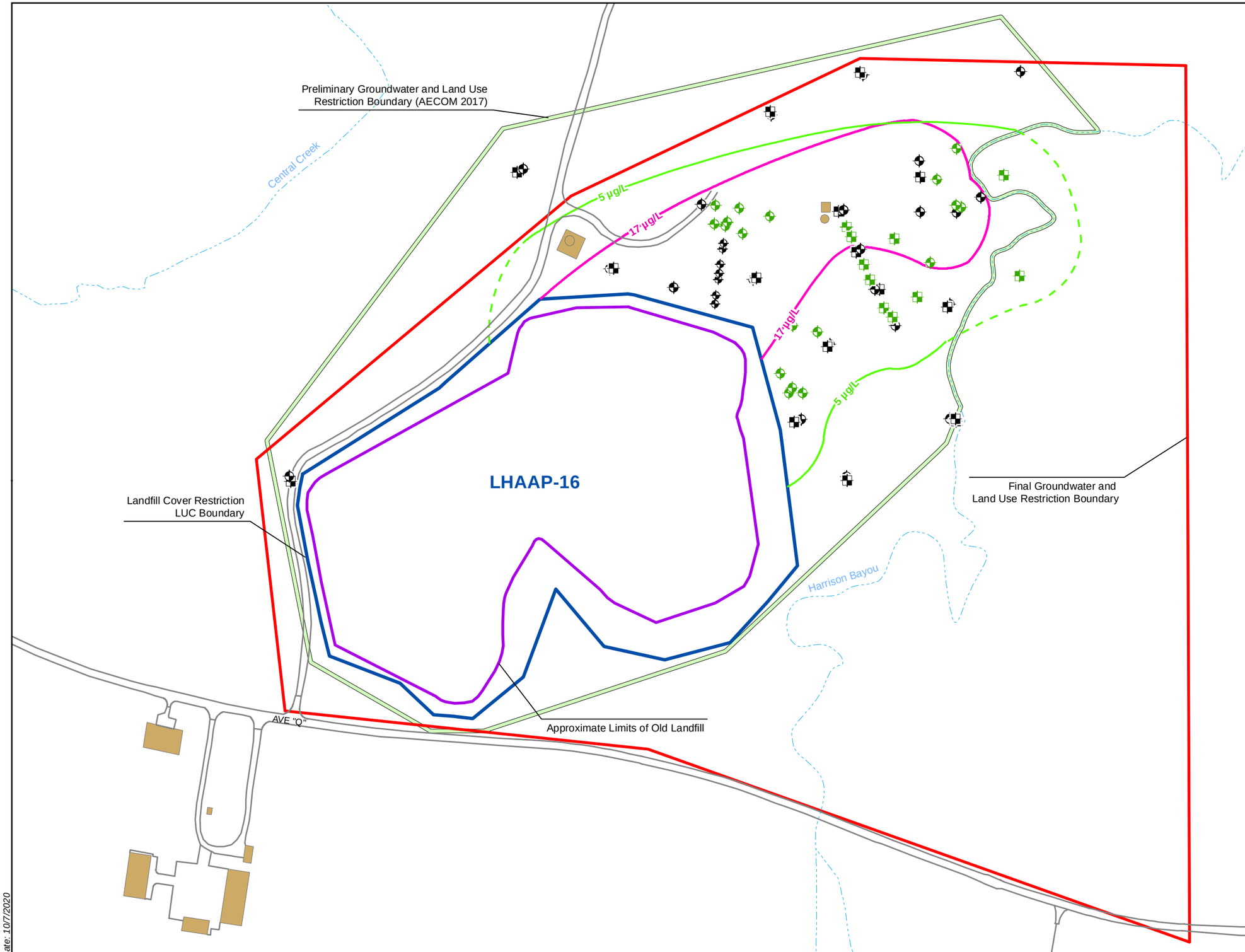
Figure 1-3

LHAAP-16 Site Plan
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-3_SitePlan.mxd



Shallow Well Installed 2018 or 2019

Intermediate Well Installed 2018 or 2019

Existing Shallow Monitoring Well

Existing Intermediate Monitoring Well

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (September 2019)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (September 2019)

Stream

Road

Final Groundwater and Land Use Restriction Boundary

Landfill Cover Restriction LUC Boundary

Approximate Limits of Old Landfill

Preliminary Groundwater and Land Use Restriction Boundary (AECOM 2017)

Building or Tank

Notes:
1. µg/L - micrograms per liter
2. LUC - land use control
3. TCE - trichloroethene
4. The eastern side of the Final Groundwater and Land Use Restriction Boundary is shared with the western edge of a similar land use restriction that will cover LHAAP-17 and LHAAP-18/24 located to the east of LHAAP-16.

N

0 110 220 Feet

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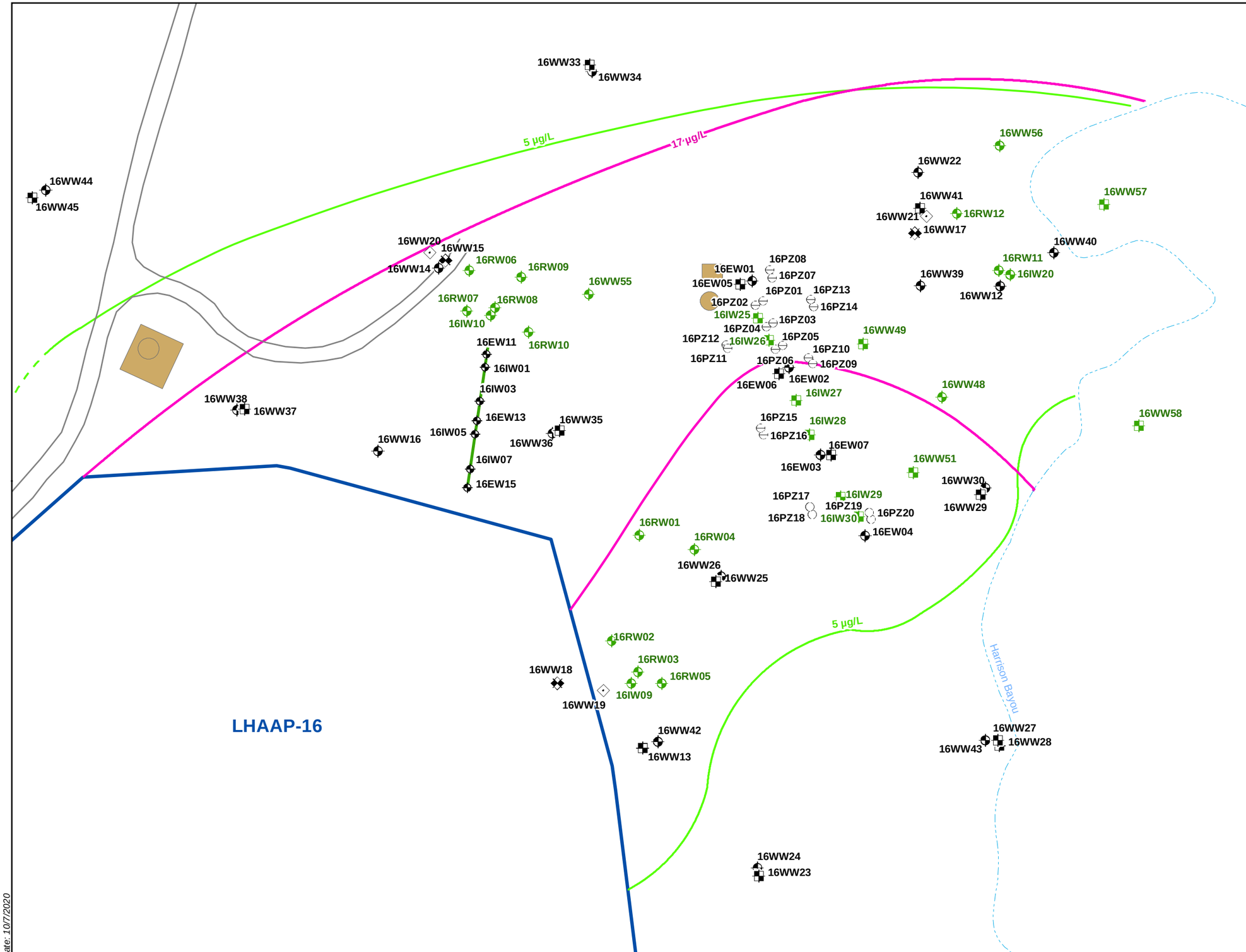
Figure 1-4

Final LUC Boundaries
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-4_FinalLUCBoundaries.mxd



Shallow Well Installed 2018 or 2019

Intermediate Well Installed 2018 or 2019

Existing Shallow Monitoring Well

Existing Intermediate Monitoring Well

Existing Upper Deep Monitoring Well

Existing Lower Deep Monitoring Well

Piezometer

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (May 2013)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)

Location of Semi-Passive Biobarrier Demonstration (February 2004 through June 2006 [Geosyntec 2009])

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. µg/L - micrograms per liter
2. TCE - trichloroethene

N

0 50 100 Feet

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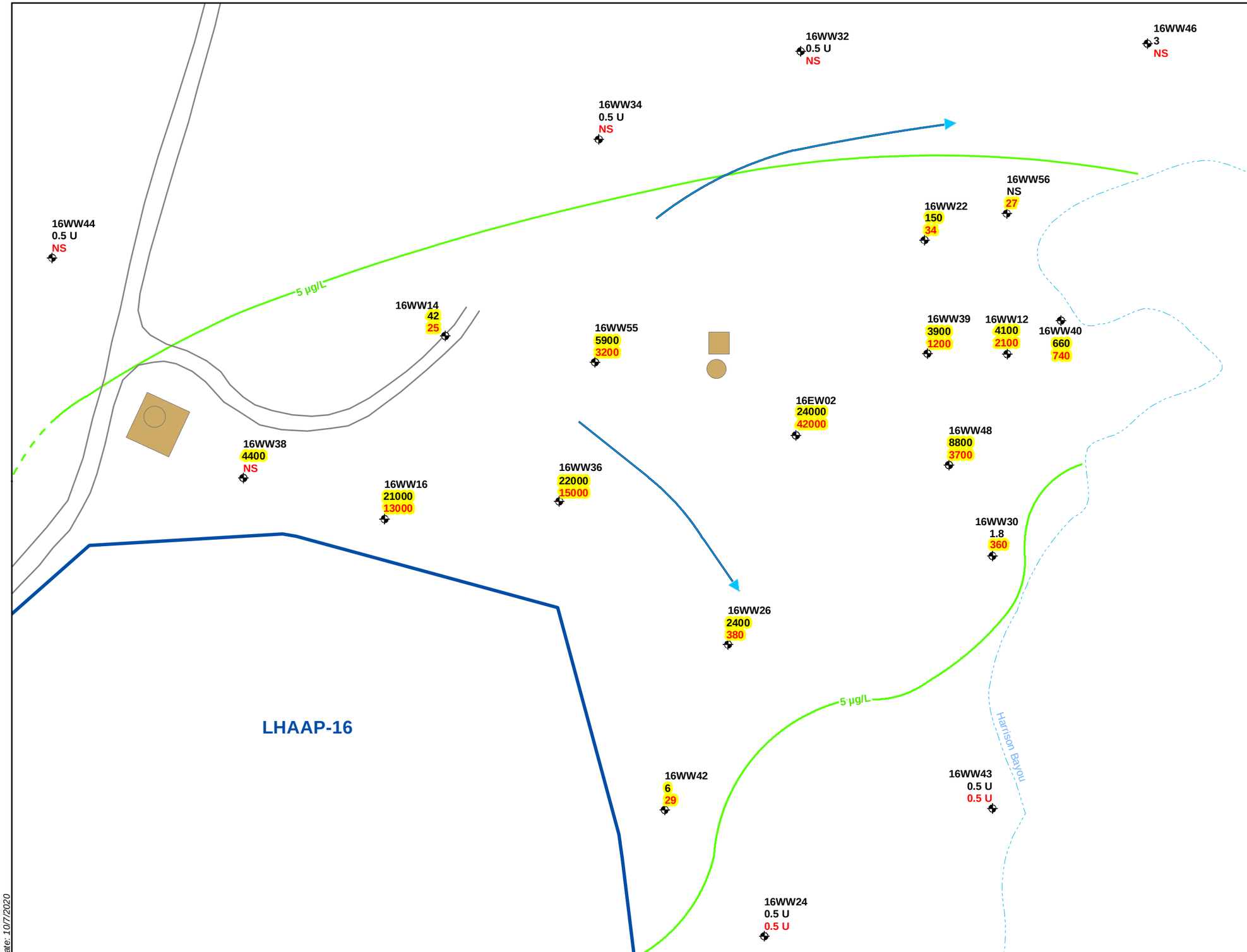
Figure 2-1

Wells Added for Remedial Action
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig2-1_WellsAddedForRemedialAction.mxd



Shallow Monitoring Well

Groundwater Flow Direction (October 2018)

Extent of Trichloroethene Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. All results are in µg/L.
2. For each location, the black result is from October 2018 and the red result is from September 2019. Results that exceed the MCL are highlighted.
3. The MCL for Trichloroethene is 5 µg/L.
4. Abbreviations/acronyms:
   µg/L - micrograms per liter
   ID - identification
   MCL - maximum contaminant limit.
   NS - not sampled
   U - Undetected. The analyte was analyzed for, but not detected above the associated detection limit.

N

0 50 100 Feet

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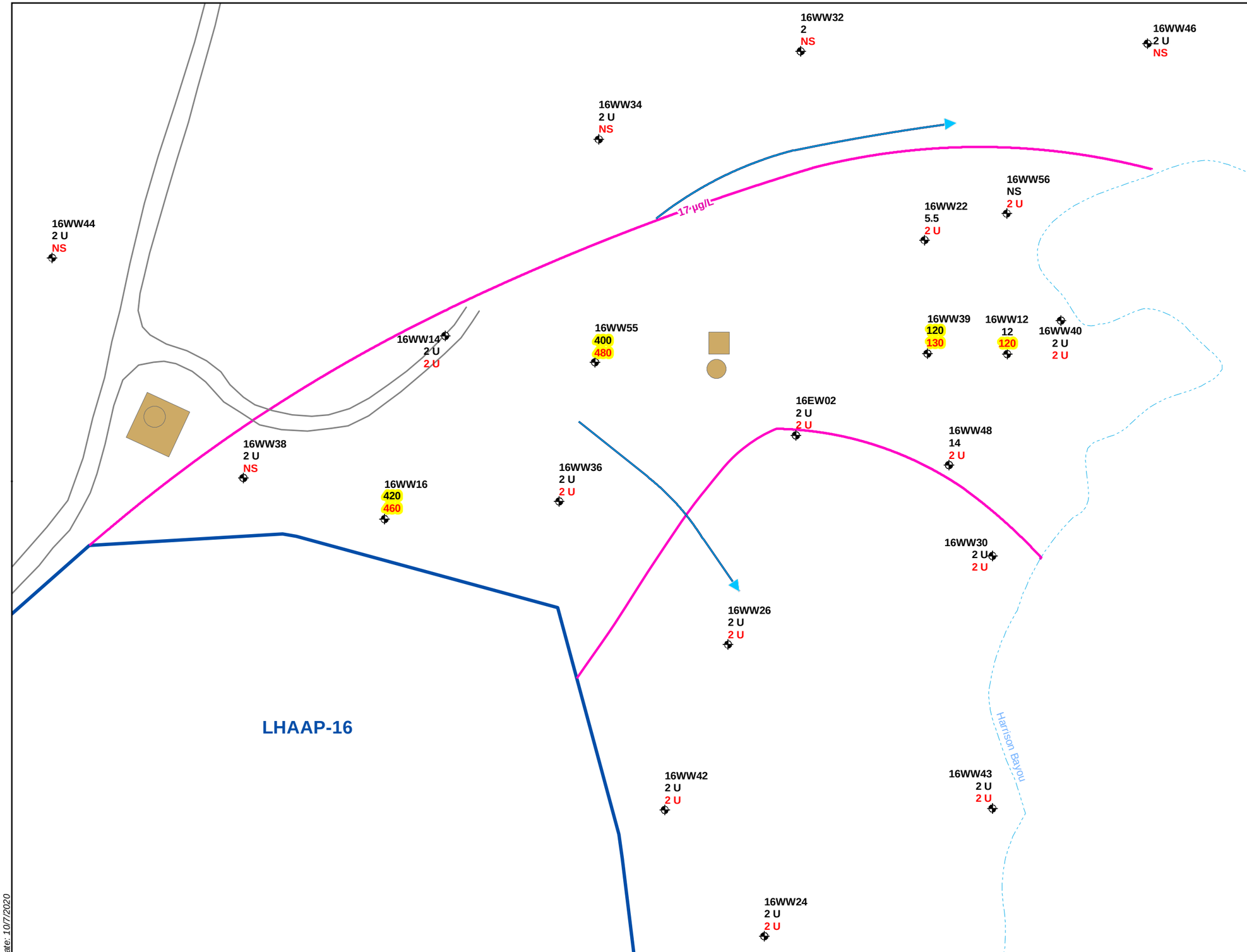
Figure 3-1
Trichloroethene Baseline Concentrations
Shallow Groundwater
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig3-1_TCEBaselineShallow.mxd



Shallow Monitoring Well

Groundwater Flow Direction (October 2018)

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (May 2013)

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. All results are in µg/L.
2. For each location, the black result is from October 2018 and the red result is from September 2019. Results that exceed the PCL are highlighted.
3. The PCL for Perchlorate is 17 µg/L.
4. Abbreviations/acronyms:
   µg/L - micrograms per liter
   ID - identification
   NS - not sampled
   PCL - protected concentration level.
   U - Undetected. The analyte was analyzed for, but not detected above the associated detection limit.

N

0 50 100 Feet

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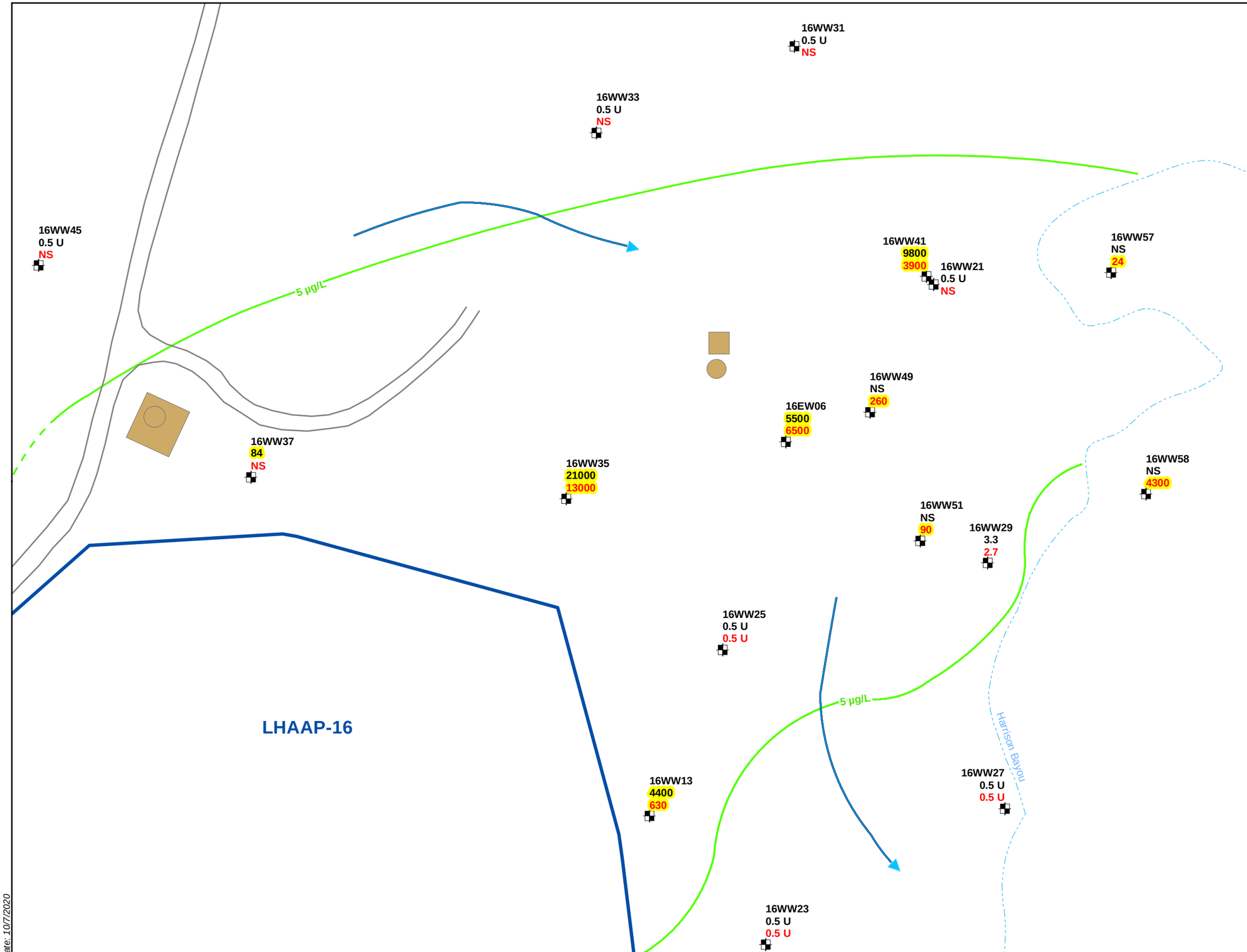
Figure 3-2
Perchlorate Baseline Concentrations
Shallow Groundwater
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig3-2_PerchBaselineShallow.mxd



Shallow Monitoring Well

Groundwater Flow Direction (October 2018)

Extent of Trichloroethene Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. All results are in µg/L.
2. For each location, the black result is from October 2018 and the red result is from September 2019. Results that exceed the MCL are highlighted.
3. The MCL for Trichloroethene is 5 µg/L.
4. Abbreviations/acronyms:
   µg/L - micrograms per liter
   ID - identification
   MCL - maximum contaminant limit.
   NS - not sampled
   U - Undetected. The analyte was analyzed for, but not detected above the associated detection limit.

N

0 50 100 Feet

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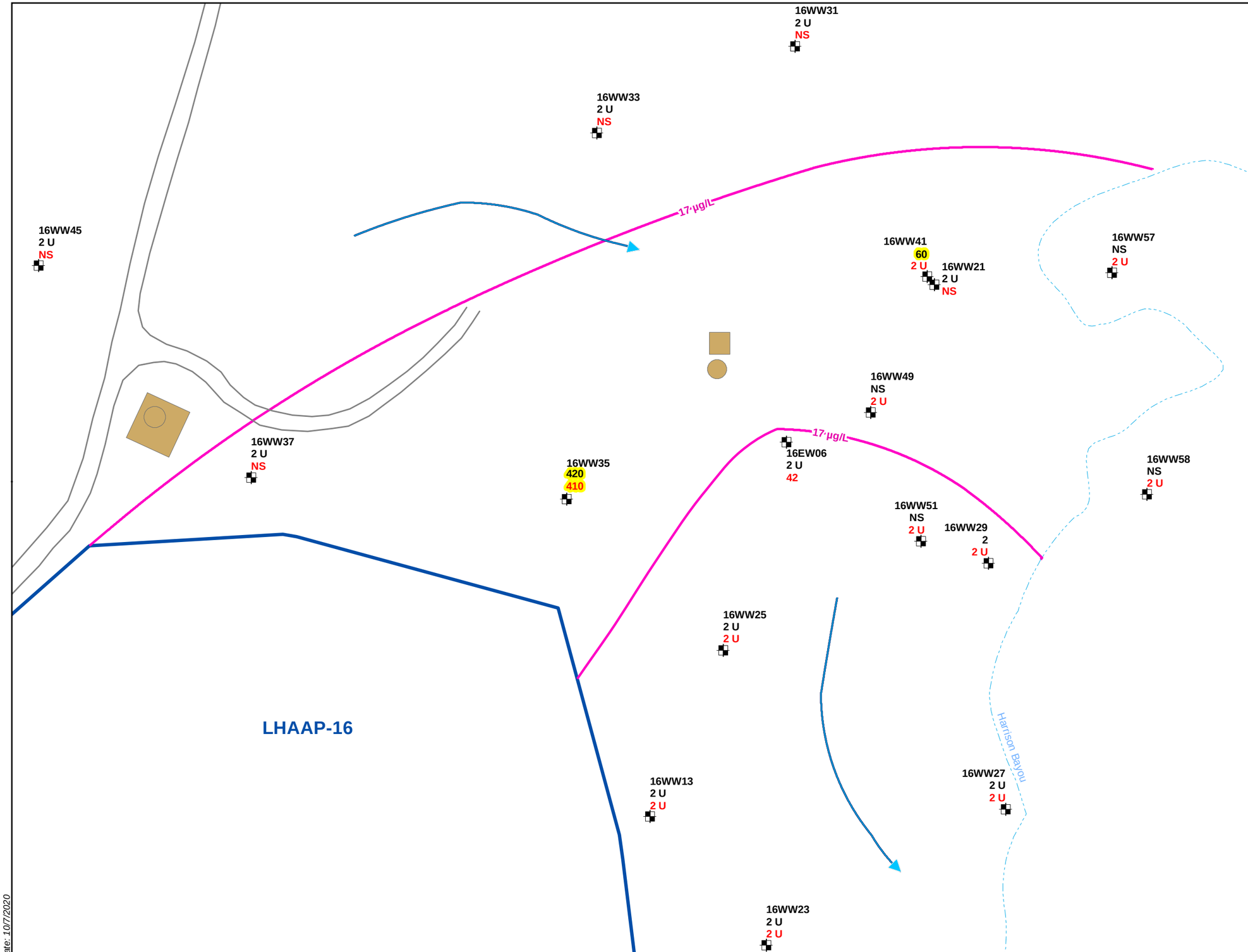
Figure 3-3
Trichloroethene Baseline Concentrations
Intermediate Groundwater
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig3-3_TCEBaselineIntermediate.mxd



Intermediate Monitoring Well

Groundwater Flow Direction (October 2018)

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (May 2013)

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. All results are in µg/L.
2. For each location, the black result is from October 2018 and the red result is from September 2019. Results that exceed the PCL are highlighted.
3. The PCL for Perchlorate is 17 µg/L.
4. Abbreviations/acronyms:
   µg/L - micrograms per liter
   ID - identification
   NS - not sampled
   PCL - protected concentration level.
   U - Undetected. The analyte was analyzed for, but not detected above the associated detection limit.

N

0 50 100 Feet

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Figure 3-4
Perchlorate Baseline Concentrations
Intermediate Groundwater
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

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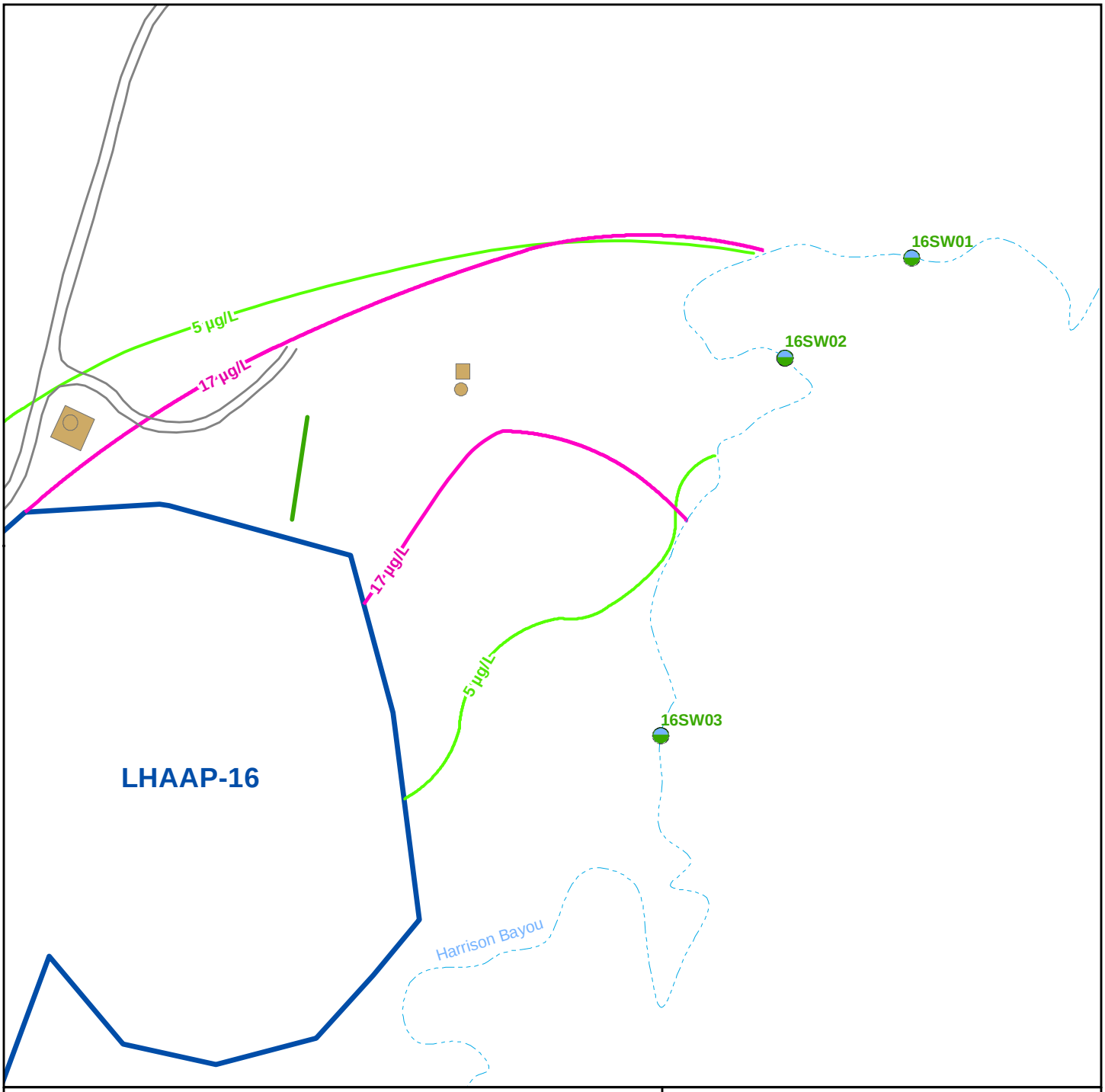

Surface Water Sample Location

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (May 2013)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)

Location of Semi-Passive Biobarrier Demonstration (February 2004 through June 2006 [Geosyntec 2009])

Stream

Road

LHAAP-16 Landfill Fence

Building or Tank

Notes:
1. µg/L - micrograms per liter
2. TCE - trichloroethene

N

0 110 220 Feet

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Figure 3-5

Surface Water Sampling Locations
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig3-5_SurfaceWaterSamplingLocations.mxd

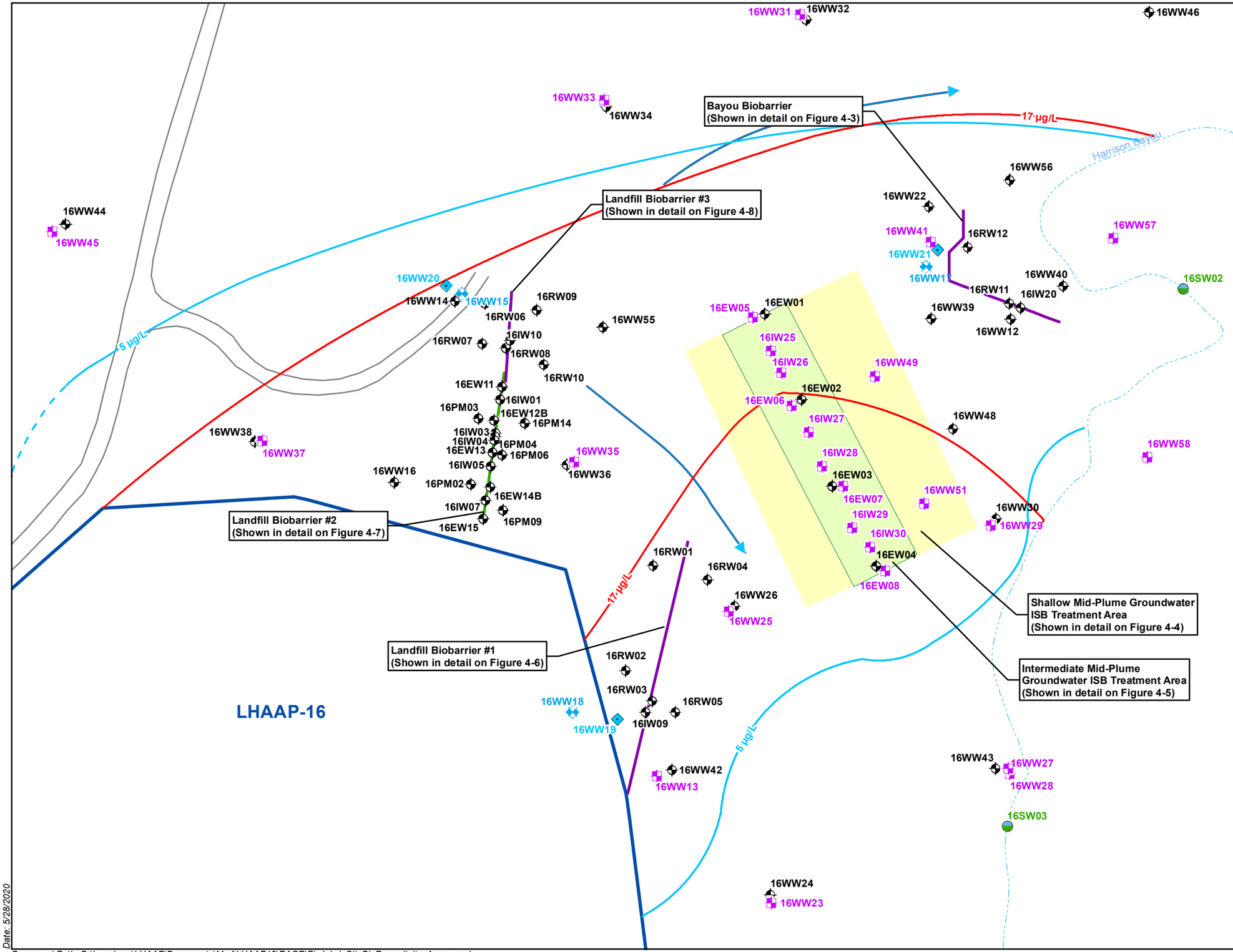

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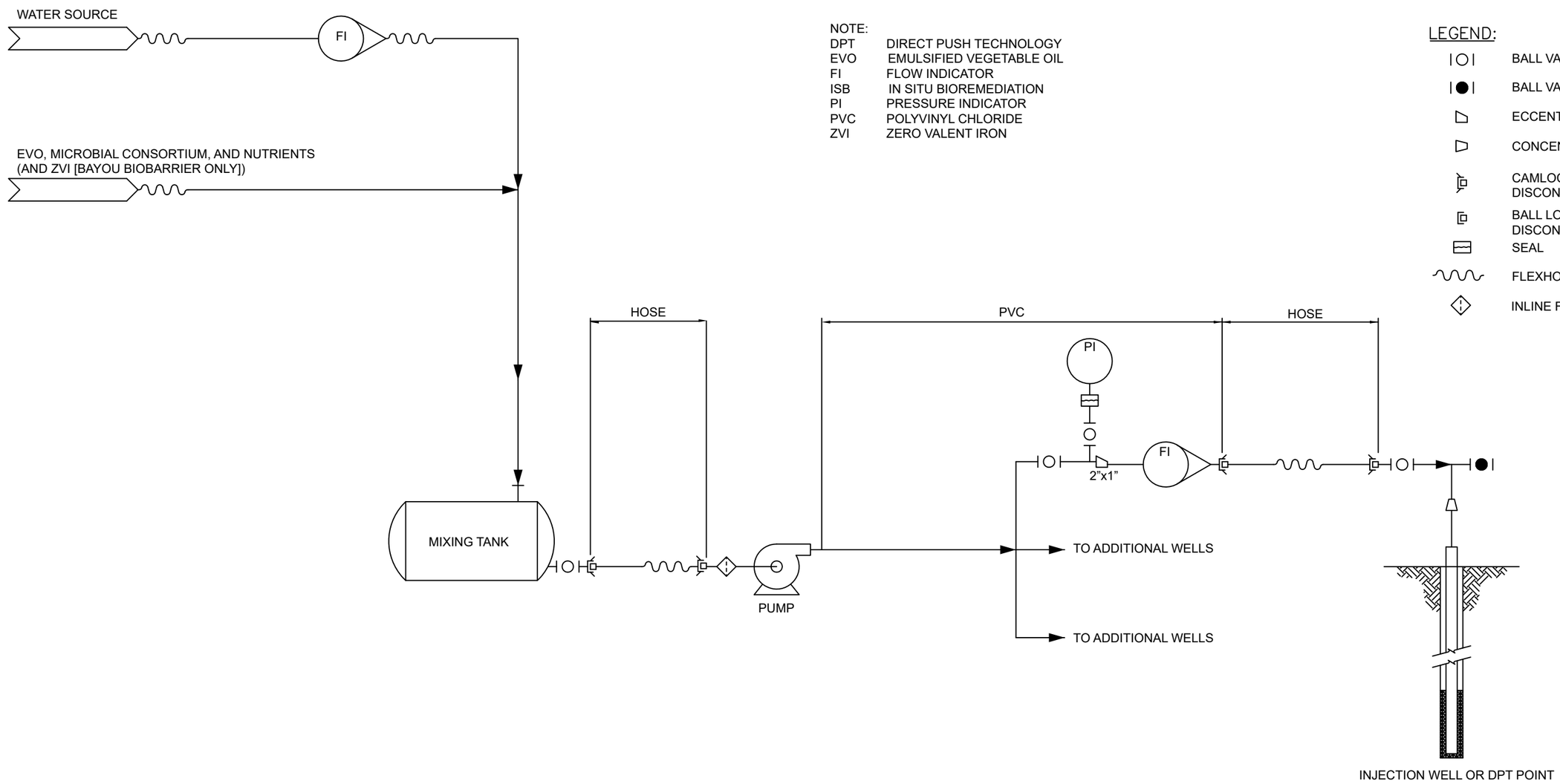
Figure 4-1

In-Situ Bioremediation
Areas at LHAAP-16
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-1_InSituBioRemediationAreas.mxd



NOTE:

DPT	DIRECT PUSH TECHNOLOGY
EVO	EMULSIFIED VEGETABLE OIL
FI	FLOW INDICATOR
ISB	IN SITU BIOREMEDIATION
PI	PRESSURE INDICATOR
PVC	POLYVINYL CHLORIDE
ZVI	ZERO VALENT IRON

LEGEND:

- BALL VALVE (OPEN)
- BALL VALVE (CLOSED)
- ECCENTRIC REDUCER
- CONCENTRIC REDUCER
- CAMLOCK QUICK DISCONNECT
- BALL LOCK QUICK DISCONNECT
- SEAL
- FLEXHOSE
- INLINE FILTER

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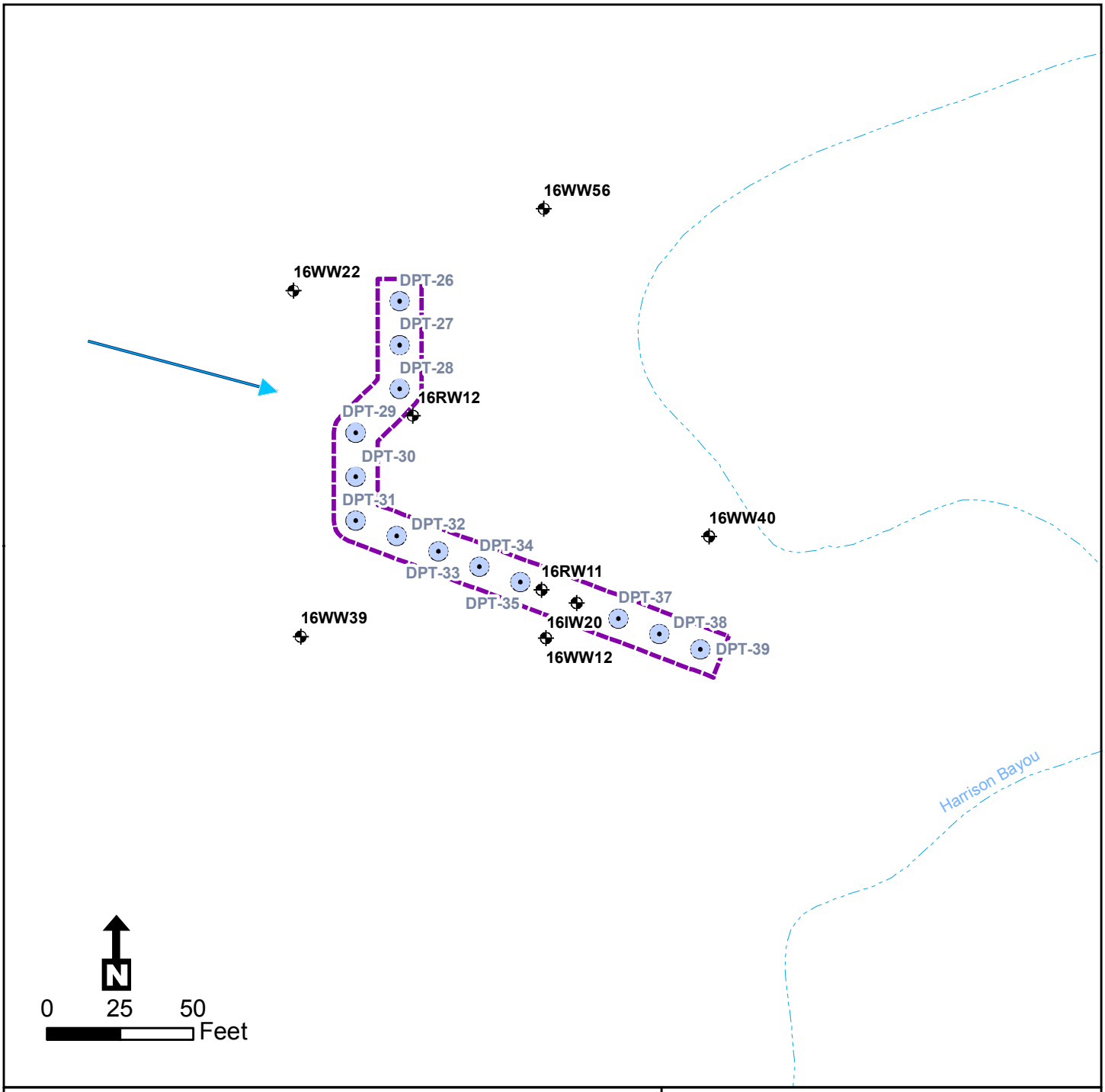
FIGURE 4-2

ISB Injection System
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Shallow Well

Direct Push Injection Point

Groundwater Flow Direction (October 2018)

Target In Situ Reaction Zone Based on Design Radius of Influence

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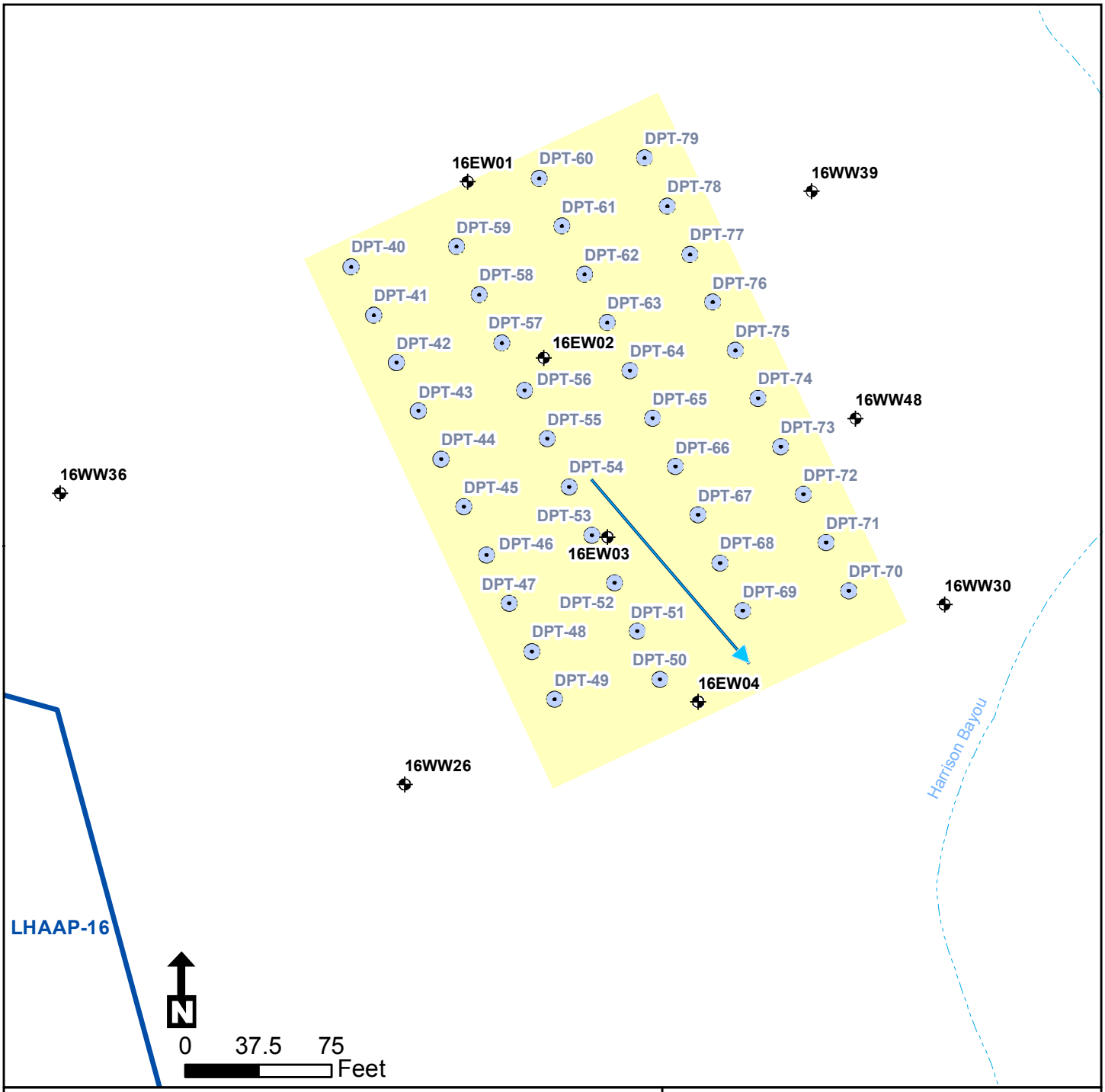
Figure 4-3

Bayou Biobarrier
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-3_Landfill_Biobarrier_Bayou.mxd



Shallow Zone Extraction or Monitoring Well

Direct Push Injection Point

Groundwater Flow Direction (October 2018)

Stream

Shallow In Situ Bioremediation Area

LHAAP-16 Landfill Fence

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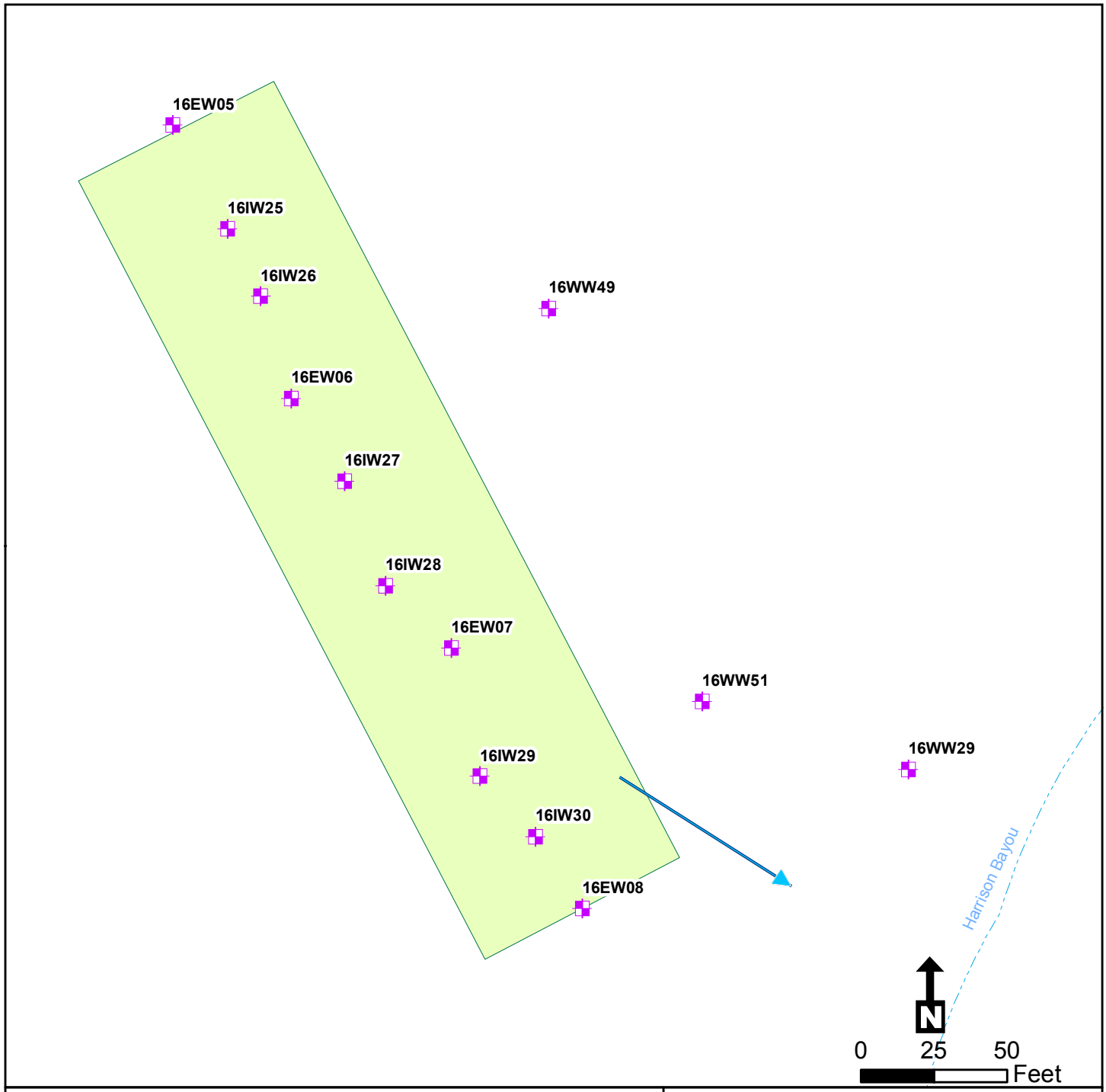
Figure 4-4

Mid-Plume Shallow Groundwater Zone
Biogrid
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-4_Biobarrier_MidPlume_Shallow.mxd



Intermediate Zone Injection, Extraction, or Monitoring Well

Groundwater Flow Direction (October 2018)

Stream

Intermediate Groundwater Zone In Situ Bioremediation Area

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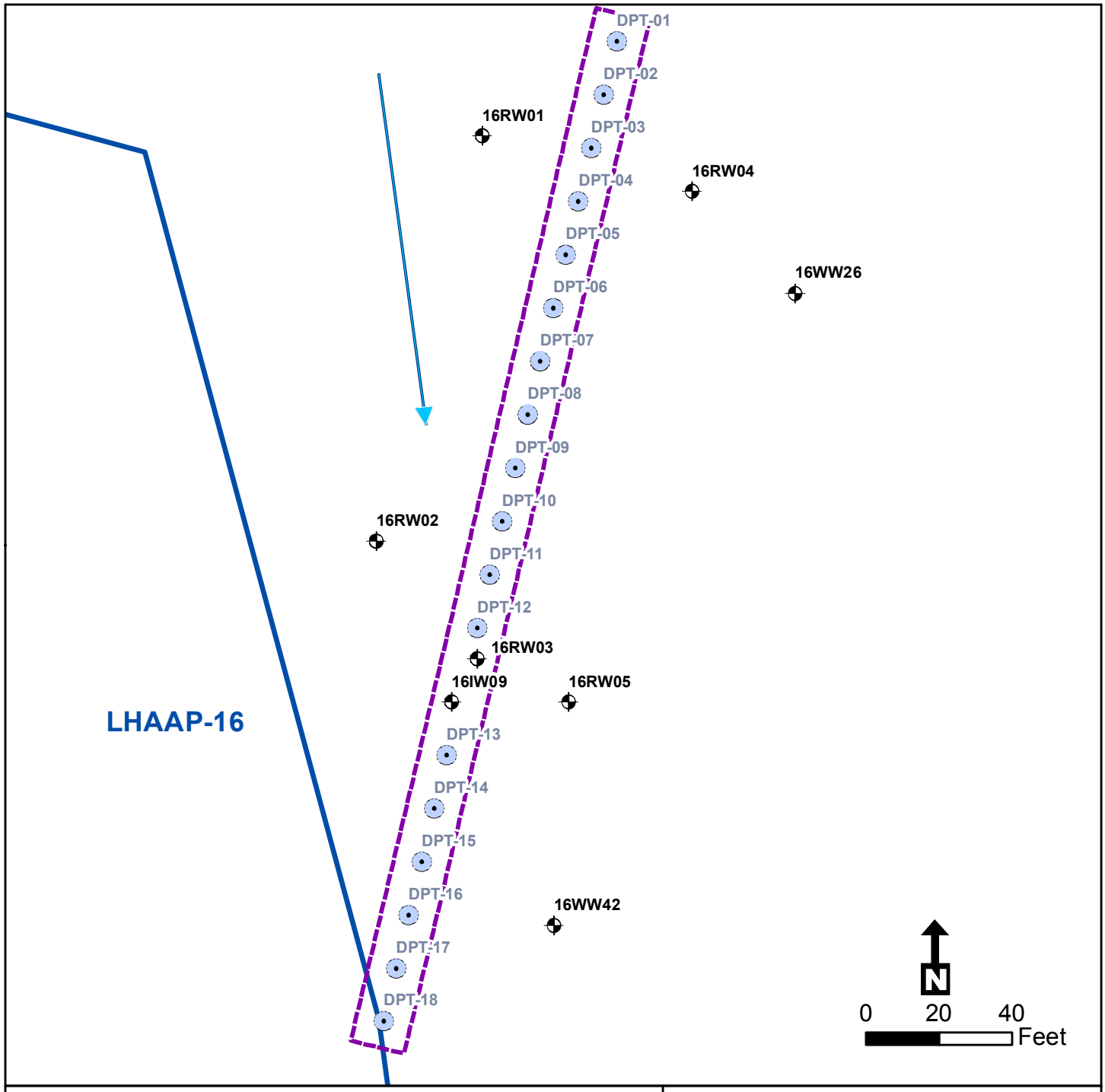
Figure 4-5

Mid-Plume Intermediate Groundwater Zone
Biobarrier
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-5_Biobarrier_Intermediate.mxd



Shallow Well Location

Direct Push Injection Point

Groundwater Flow Direction (October 2018)

Target In Situ Reaction Zone

LHAAP-16 Landfill Fence

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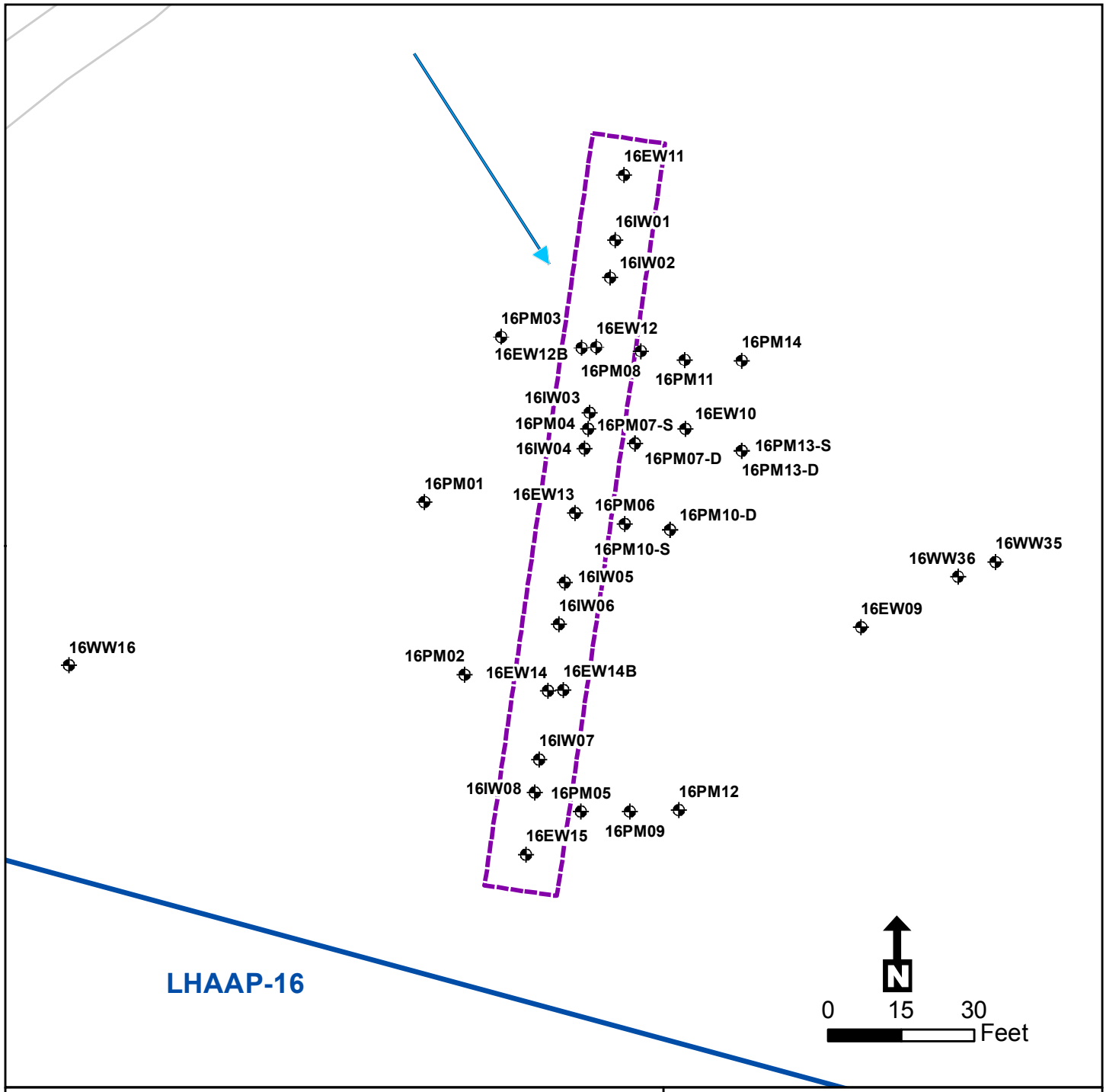
Figure 4-6

Landfill Biobarrier #1
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-6_Landfill_Biobarrier_1.mxd



Shallow Extraction, Injection, or Monitoring Well

Groundwater Flow Direction (October 2018)

Target In Situ Reaction Zone

LHAAP-16 Landfill Fence

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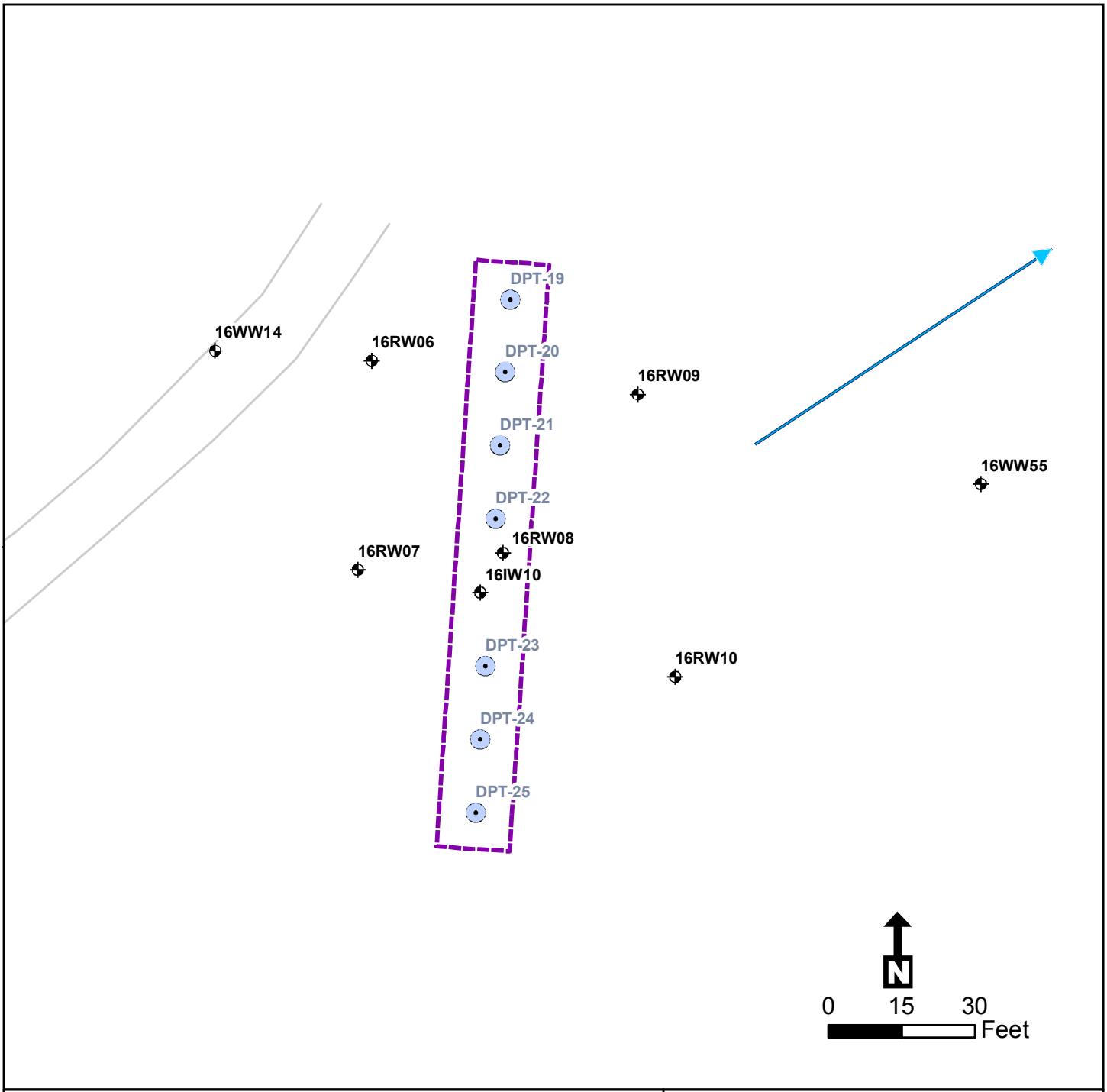
Figure 4-7

Landfill Biobarrier #2
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-7_Landfill_Biobarrier_2.mxd



Shallow Zone Injection, Monitoring, or Recovery Well

Direct Push Injection Point

Groundwater Flow Direction (October 2018)

Target In Situ Reaction Zone

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Figure 4-8

Landfill Biobarrier #3
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig4-8_Landfill_Biobarrier_3.mxd

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • April 2021

Appendix A

Notice of LUCs and Final LUC Boundary

2021-000003204

*** DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT***

NOTICE

9 Pages

FILED AND RECORDED-OPR	CLERKS NOTES
On: 03/22/2021 03:29 PM	
Document Number: 2021-000003204	
Receipt No: 2103298	
Amount: $ 54.00	
By: Emily Najera, Deputy	
Elizabeth James, County Clerk Harrison County, Texas	

STATE OF TEXAS

COUNTY OF HARRISON

I hereby certify that this instrument was filed on the date and time stamped hereon by me and was duly recorded in the Official Public Records of Harrison County, Texas.

Elizabeth James

Elizabeth James, Harrison County Clerk

Record and Return To:

WILLIAM FOSS
2500 CITY WEST BLVD., SUITE 1700

HOUSTON, TX 77042

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROLS AT LHAAP-16

KNOW ALL MEN BY THESE PRESENTS THAT:

Pursuant to the Rules of the Texas Commission on Environmental Quality (TCEQ) pertaining to Industrial Solid Waste Management, this document is hereby filed in the Public Records of Harrison County, Texas in compliance with the recordation requirements of said rules:

I

The U.S. Army, Department of Defense, has performed remedial activities at the land described herein. The remediation site is a capped landfill, located in the south-central portion of the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-16. LHAAP was placed on the National Priorities List (NPL) in August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA) and the TCEQ (formerly known as the Texas Water Commission) entered into an agreement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120 for remedial activities. The CERCLA Section 120 Agreement, referred to as the Federal Facility Agreement (FFA), became effective on December 30, 1991. Remedial activities at LHAAP-16 were performed in accordance with the FFA requirements.

The LHAAP-16 landfill was established in the 1940s and was used for disposal of solid and industrial wastes until the 1980s when disposal activities were terminated. A multilayer cap was completed in 1998 as an early interim remedial action to mitigate potential risks posed by buried source material at the site. The U.S. Department of the Army issued the Final ROD for LHAAP-16, for the final remedy which includes in situ enhanced bioremediation and monitored natural attenuation for groundwater, maintenance and repair of the landfill cap, and land use controls. The ROD was cosigned by USEPA on September 13, 2016. The TCEQ issued a letter concurring with the ROD on September 6, 2016. The LUCs at LHAAP-16 will ensure protection of human health by preserving the integrity of the cap end restricting intrusive activities; restricting groundwater use to environmental monitoring and testing only, restricting use to non-residential, and maintaining groundwater monitoring and remediation systems until levels of contaminants of concern (COCs) allow for unlimited use and unrestricted exposure.

Further information may be found by examination of the Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E (Room 103. first floor) 12100 Park 35 Circle, Austin, Texas 78753, (512) 239-2900, Monday through Friday 8:00 am to 5:00 pm, or the Administrative Record available at the Marshall Public Library, 300 South Alamo Boulevard, Marshall, Texas 75670, (930) 935-4465, Monday through Friday 9:30AM – 5:30PM.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public on the conditions of the land and/or the occurrence of remediation. This notification is not a representation or warranty by the TCEQ of the suitability of this land for any purpose.

II

LHAAP-16 covers an area of approximately 13.6 acres, more or less, located in Harrison County, Texas, near the town of Karnack, being more particularly described with survey plat and metes and bounds established in **Exhibit A**. The LUC boundaries for the landfill cover restriction and the groundwater and land use restrictions encompass 17.811 acres and 70.339 acres, more or less, respectively, as described in **Exhibit A**. The LUC boundaries are also presented in the attached **Figure 1**.

Future use of the parcel is intended as a national wildlife refuge, consistent with non-residential use. For the purposes of this certification, residential land use includes, but is not limited to, single family to multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of education purpose for children/young adults in grades kindergarten through 12. The U.S. Department of the Army has undertaken careful environmental study of the LHAAP-16 site and concluded that the LUCs set forth below are required to ensure protection of human health and the environment:

- Landfill Cover Restriction. The landfill restriction boundary consists of the 17.811-acre tract. Intrusive activities (e.g., digging) are restricted as long as landfill waste remains or until the levels of COCs allow for unlimited use and unrestricted exposure.
- Groundwater Use Restriction. The groundwater use restriction boundary consists of the 70.339-acre tract, more or less, and extends beyond the landfill and LHAAP-16 site boundary. The groundwater underlying this land is contaminated with volatile organic compounds (VOCs) (trichloroethene [TCE], cis-1,2-dichloroethene [DCE], and vinyl chloride [VC]), perchlorate, and five metals (arsenic, chromium, manganese, nickel, and thallium). A prohibition of groundwater use (except for environmental monitoring and testing) as a potable source is in place until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.
- Non-Residential Use Restriction. The non-residential use restriction boundary is coincident with the boundary for Groundwater Use Restriction and consists of the 70.339-acre tract, more or less. The site is restricted to nonresidential use until it is demonstrated that surface and subsurface soil and groundwater COCs are at levels that allow for unlimited use and unrestricted exposure.

- Maintain Integrity of Monitoring Systems. The integrity of any current or future remedial or monitoring systems will remain in place until the cleanup levels of COCs in groundwater are met.

III

The owner of this site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIN-ISE-LO (H. Procter)
Program Manager/Analyst
Office of the Deputy Chief of Staff, (DAIN-ISE)
Environmental Division, BRAC Field Branch
600 Army Pentagon
Washington, D.C. 22310-0600

Or

Mr. Thomas A. Lineer
Chief
Office of the Deputy Chief of Staff, (DAIN-ISE)
Environmental Division, BRAC Field Branch
600 Army Pentagon
Washington, D.C. 22310-0600

Rose M. Zeiler
Longhorn AP Site Manager

EXECUTED this the 25th day of Feb, 2021.

BEFORE ME, on this 25th day of Feb 2021, personally appeared Rose M. Zeiler, of the United States Army, United States Department of Defense, known to me to be the person and agent of said agency whose name is subscribed to the foregoing instrument, and she acknowledged to me that she executed the same for the purposes and in the capacity therein expressed.

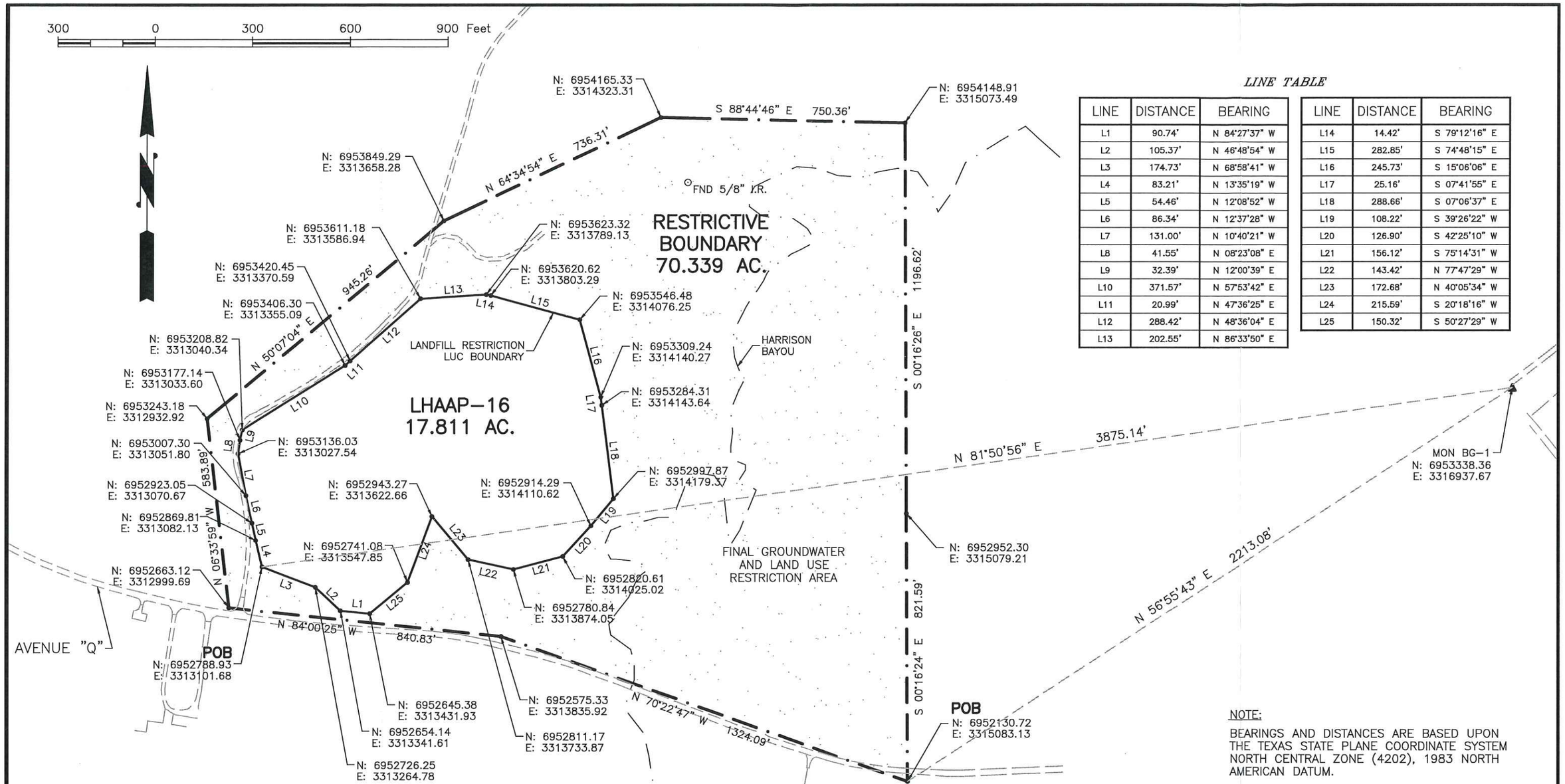
GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 25th day of February, 2021.

STATE OF ARKANSAS NOTARY PUBLIC
KAREN DAVIS
MY COMMISSION # 12382216
EXPIRES: May 20, 2021
Logan County

Notary Public in and for the State of Arkansas
County of Logan

Exhibit A

Survey and Legal Plat



LINE TABLE

LINE	DISTANCE	BEARING
L1	90.74'	N 84°27'37" W
L2	105.37'	N 46°48'54" W
L3	174.73'	N 68°58'41" W
L4	83.21'	N 13°35'19" W
L5	54.46'	N 12°08'52" W
L6	86.34'	N 12°37'28" W
L7	131.00'	N 10°40'21" W
L8	41.55'	N 08°23'08" E
L9	32.39'	N 12°00'39" E
L10	371.57'	N 57°53'42" E
L11	20.99'	N 47°36'25" E
L12	288.42'	N 48°36'04" E
L13	202.55'	N 86°33'50" E

LINE	DISTANCE	BEARING
L14	14.42'	S 79°12'16" E
L15	282.85'	S 74°48'15" E
L16	245.73'	S 15°06'06" E
L17	25.16'	S 07°41'55" E
L18	288.66'	S 07°06'37" E
L19	108.22'	S 39°26'22" W
L20	126.90'	S 42°25'10" W
L21	156.12'	S 75°14'31" W
L22	143.42'	N 77°47'29" W
L23	172.68'	N 40°05'34" W
L24	215.59'	S 20°18'16" W
L25	150.32'	S 50°27'29" W

NOTE:

BEARINGS AND DISTANCES ARE BASED UPON THE TEXAS STATE PLANE COORDINATE SYSTEM NORTH CENTRAL ZONE (4202), 1983 NORTH AMERICAN DATUM.

LEGEND

FINAL GROUND WATER AND LAND USE RESTRICTION BOUNDARY

LANDFILL COVER RESTRICTION LUC BOUNDARY

I, David R. Collins, Jr., Reg. Professional Land Surveyor, do hereby certify that this Plat is true and correct according to a survey made upon the ground DECEMBER 1, 2020.

David R. Collins, Jr. *R.P.L.S. #6488*
Firm License #10023000

STATE OF TEXAS
REGISTERED
DAVID R. COLLINS, JR.
6488
PROFESSIONAL
LAND SURVEYOR

E. T. SALTER SURVEY, A-661
HARRISON COUNTY, TEXAS

SHEET 1 OF 2

Final LUC Boundaries LHAAP-16 RACR
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Collins Surveying & Mapping, Inc.
910 Judson Road
Longview, Texas 75601
Phone: (903) 234-8051

Job Number: APTIM4761

LEGAL DESCRIPTION
LANDFILL COVER RESTRICTION LUC BOUNDARY:

All that certain 17.811 acre tract of land contained within Longhorn Army Ammunition Plant, Harrison County, Texas, said 17.811 acre tract more particularly described as follows:

BEGINNING at a point north of Avenue "Q" and east of a gravel lease road said point with the coordinates of N: 6952788.93, E: 3313101.68, from which a corps of engineers monument BG–1 found at the east corner of the roadway intersection at the entrance of Longhorn Army Ammunition Plant Burning Grounds said monument with the coordinates of N: 6953338.36, E: 3316937.67, and bears N 81°50'56" E 3875.14 feet;

THENCE: N 12°08'52" W 83.21 feet; THENCE: N 12°08'52" W 54.46 feet; N 12°37'28" W 86.34 feet; THENCE: N 10°40'21" W 131.00 feet; THENCE: N 08°23'08" E 41.55 feet; THENCE: N 12°00'39" E 32.39 feet; THENCE: N 57°53'42" E 371.57 feet; THENCE: N 47°36'25" E 20.99 feet; THENCE: N 48°36'04" E 288.42 feet; THENCE: N 86°33'50" E 202.55 feet; THENCE: S 79°12'16" E 14.42 feet; THENCE: S 74°48'15" E 282.85 feet; THENCE: S 15°06'06" E 245.73 feet; THENCE: S 07°41'55" E 25.16 feet; THENCE: S 07°06'37" E 288.66 feet; THENCE: S 39°26'22" W 108.22 feet; THENCE: S 42°25'10" W 126.90 feet; THENCE: S 75°14'31" W 156.12 feet; THENCE: N 77°47'29" W 143.42 feet; THENCE: N 40°05'34" W 172.68 feet; THENCE: S 20°18'16" W 215.59 feet; THENCE: S 50°27'29" W 150.32 feet; THENCE: N 84°27'37" W 90.74 feet; THENCE: N 46°48'54" W 105.37 feet;

THENCE: N 68°58'41" W 174.73 feet to the POINT OF BEGINNING, containing 17.811 acres of land, more or less.

LEGAL DESCRIPTION
FINAL GROUND WATER AND LAND USE RESTRICTION BOUNDARY:

All that certain 70.339 acre tract of land contained within Longhorn Army Ammunition Plant, Harrison County, Texas, said 17.811 acre tract more particularly described as follows:
BEGINNING at a point south of Avenue "Q" with the coordinates of N: 6952130.72, E: 3315083.13, from which a corps of engineers monument BG–1 found at the east corner of the roadway intersection at the entrance of Longhorn Army Ammunition Plant Burning Grounds said monument with the coordinates of N: 6953338.36, E: 3316937.67, and bears N 56°55'43" E 2213.08 feet;
THENCE: N 70°22'47" W generally along said Avenue "Q" 1324.09 feet to a point north of said Avenue "Q" for an angle point;
THENCE: N 84°00'25" W generally along the north edge of said Avenue "Q" 840.83 feet to a point for the southwest corner of this tract; THENCE: N 06°33'59" W 583.89 feet; THENCE: N 50°07'04" E 945.26 feet; THENCE: N 64°34'54" E 736.31 feet; THENCE: S 88°44'46" E 750.36 feet to a point for the northeast corner of this tract; THENCE: S 00°16'26" E 1196.62 feet;
THENCE: S 00°16'24" E 821.59 feet to the POINT OF BEGINNING, containing 70.339 acres of land, more or less.

SHEET 2 OF 2

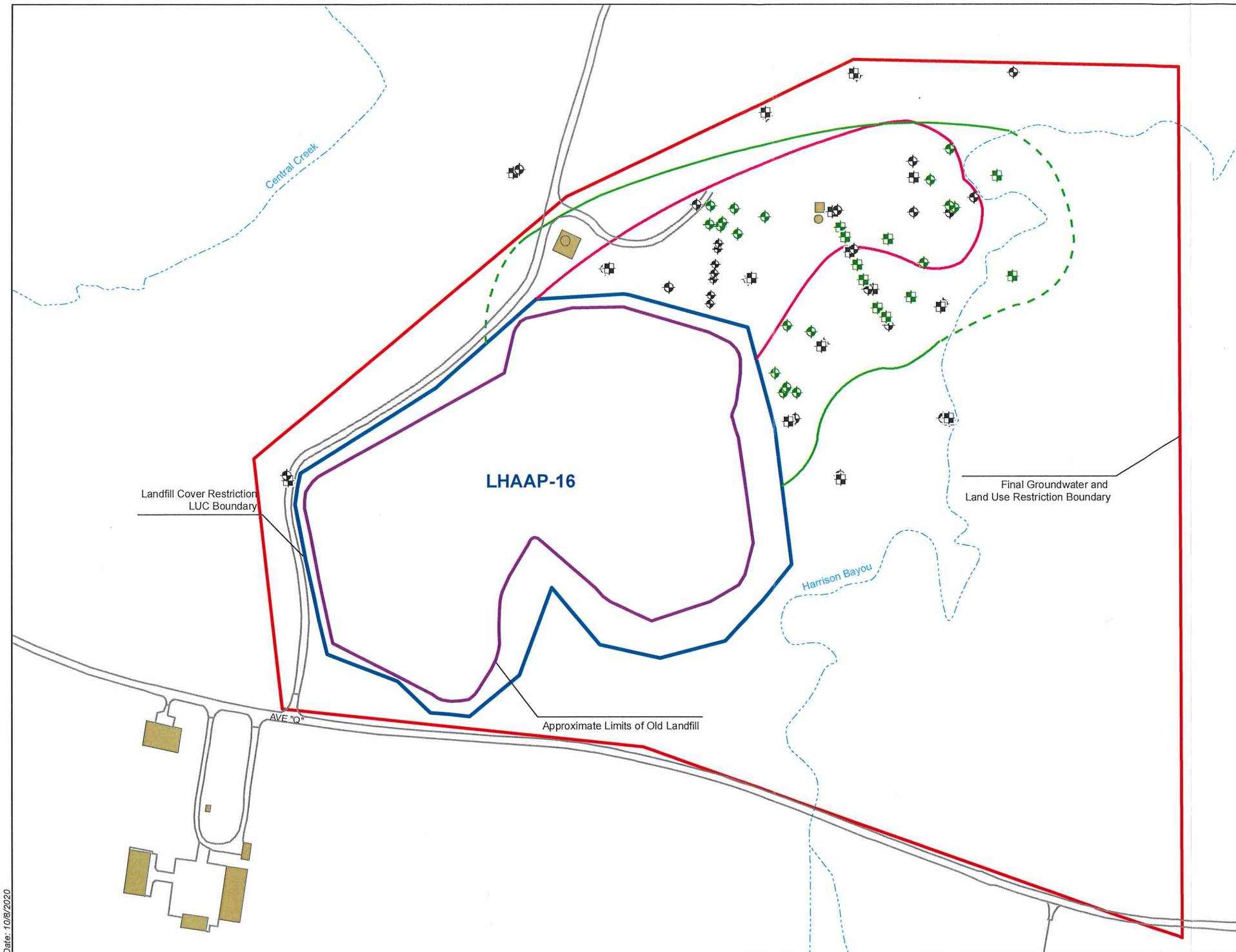
Final LUC Boundaries LHAAP–16 RACR
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Collins Surveying & Mapping, Inc.
910 Judson Road
Longview, Texas 75601
Phone: (903) 234–8051

Job Number: APTIM4761

Figure 1

Final LUC Boundaries



Shallow Well Installed 2018 or 2019

Intermediate Well Installed 2018 or 2019

Existing Shallow Monitoring Well

Existing Intermediate Monitoring Well

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (September 2019)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (September 2019)

Stream

Road

Final Groundwater and Land Use Restriction Boundary

Landfill Cover Restriction LUC Boundary

Approximate Limits of Old Landfill

Building or Tank

Notes:
1. µg/L - micrograms per liter
2. LUC - land use control
3. TCE - trichloroethene
4. The eastern side of the Final Groundwater and Land Use Restriction Boundary is shared with the western edge of a similar land use restriction that will cover LHAAP-17 and LHAAP-18/24 located to the east of LHAAP-16.

N

0 110 220 Feet

U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure 1

Final LUC Boundaries
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/8/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1_FinalLUCBoundaries.mxd

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

February 23, 2021

DAIN-ODB-LO

Hon. Chad L. Sims
Harrison County Judge
#1 Peter Whetstone Square, Room 314
Marshall, Texas 75670

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Judge Sims,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

Attachments:
LHAAP-04 Land Use Controls for Soil and Groundwater Contamination
LHAAP-04 Site Location Map
LHAAP-04 Final Land Use Control Boundary Map
LHAAP-16 Land Use Controls for Soil and Groundwater Contamination
LHAAP-16 Site Location Map
LHAAP-16 Final Land Use Control Boundary Map

Copies furnished:
A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Mr. Thomas Speir
Chairman, Harrison County Historical Commission
200 West Houston Street
Marshall, Texas 75670

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Mr. Speir,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

Attachments:
LHAAP-04 Land Use Controls for Soil and Groundwater Contamination
LHAAP-04 Site Location Map
LHAAP-04 Final Land Use Control Boundary Map
LHAAP-16 Land Use Controls for Soil and Groundwater Contamination
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LHAAP-16 Final Land Use Control Boundary Map

Copies furnished:
A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Mr. William D. Hatfield
Harrison County Commissioner, Precinct 1
Waskom Sub-Courthouse
165 West Texas Avenue
Waskom, Texas 75692

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Commissioner Hatfield,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

Attachments:
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LHAAP-16 Final Land Use Control Boundary Map

Copies furnished:
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L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Hon. Judye Patterson
Mayor, City of Uncertain, Texas
P.O. Box 277
Uncertain, Texas 75661

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Mayor Patterson,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

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

February 23, 2021

DAIN-ODB-LO

Mr. Eric Duerkop
Manager, Caddo Lake National Wildlife Refuge
15600 Highway 134
Karnack, Texas 75661

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Mr. Duerkop,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

Attachments:
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L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Mr. Terry Britt
President, Caddo Lake Water Supply Corporation
P.O. Box 136
Uncertain, Texas 75661

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Mr. Britt,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

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K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Mr. Carl Shelton
President, Leigh Water Supply Corporation
342 Byrd Circle
Karnack, Texas 75661

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Mr. Shelton,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

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L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Rep. Chris Paddie
Texas House of Representatives, District 9
102 West Houston Street
Marshall, Texas 75670

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Representative Paddie,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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Sincerely,

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

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A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Sen. Bryan Hughes
Texas State Senate, District 1
201 West Houston Street, Suite 106
Marshall, Texas 75670

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Senator Hughes,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

Sincerely,

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

Attachments:
LHAAP-04 Land Use Controls for Soil and Groundwater Contamination
LHAAP-04 Site Location Map
LHAAP-04 Final Land Use Control Boundary Map
LHAAP-16 Land Use Controls for Soil and Groundwater Contamination
LHAAP-16 Site Location Map
LHAAP-16 Final Land Use Control Boundary Map

Copies furnished:
A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Texas Department of Licensing and Regulation
Water Well Drillers and Pump Installers Program
P.O. Box 12157
Austin, Texas 78711

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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

February 23, 2021

DAIN-ODB-LO

Rep. Louis Gohmert
United States House of Representatives
Texas 1st Congressional District
102 West Houston Street
Marshall, Texas 75670

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Representative Gohmert,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Sen. John Cornyn
United States Senate
Regions Bank Building
100 East Ferguson Street, Suite 1004
Tyler, Texas 75702

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Senator Cornyn,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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Copies furnished:
A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

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

February 23, 2021

DAIN-ODB-LO

Sen. Ted Cruz
United States Senate
305 South Broadway, Suite 501
Tyler, Texas 75702

Re: Land Use Controls and Final Land Use Control Boundary for Soil and Groundwater Contamination at Two Environmental Sites at Former Longhorn Army Ammunition Plant, Karnack, Texas, February 2021

Dear Senator Cruz,

The final remedial actions for two sites, LHAAP 04, Former Pilot Wastewater Treatment Plant; and LHAAP-16 Landfill 16, were completed in November 2019 and December 2019, respectively. The attached information is provided to fulfill a requirement of the Remedial Action Completion Report for each site by giving notice of the land use restrictions referenced in the Record of Decision and to provide a Final Land Use Control boundary map. These notices are being sent to federal, state and local governments involved at this site and the owners and occupants of the property subject to the use restrictions and land use controls.

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A. Palmie, TCEQ, Austin, TX
L. Poulos, USEPA, Dallas, TX
K. Nemmers, Bhate, Lakewood, CO (Administrative Record)

Land Use Controls for Soil and Groundwater Contamination

LHAAP-04 Former Pilot Wastewater Treatment Plant
Longhorn Army Ammunition Plant, Karnack, Texas

The Longhorn Army Ammunition Plant (LHAAP) is an inactive government-owned, formerly contractor-operated and maintained Department of Defense facility located in central east Texas in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas. The facility is approximately 40 miles west of Shreveport, Louisiana. The installation occupies approximately 1,100 of its former 8,416 acres between State Highway 43 at Karnack, Texas and the southwestern shore of Caddo Lake. The installation can be accessed by State Highways 43 and 134.

LHAAP was placed on the National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the Texas Commission of Environmental Quality [TCEQ]) entered into a CERCLA Section 120 Federal Facilities Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

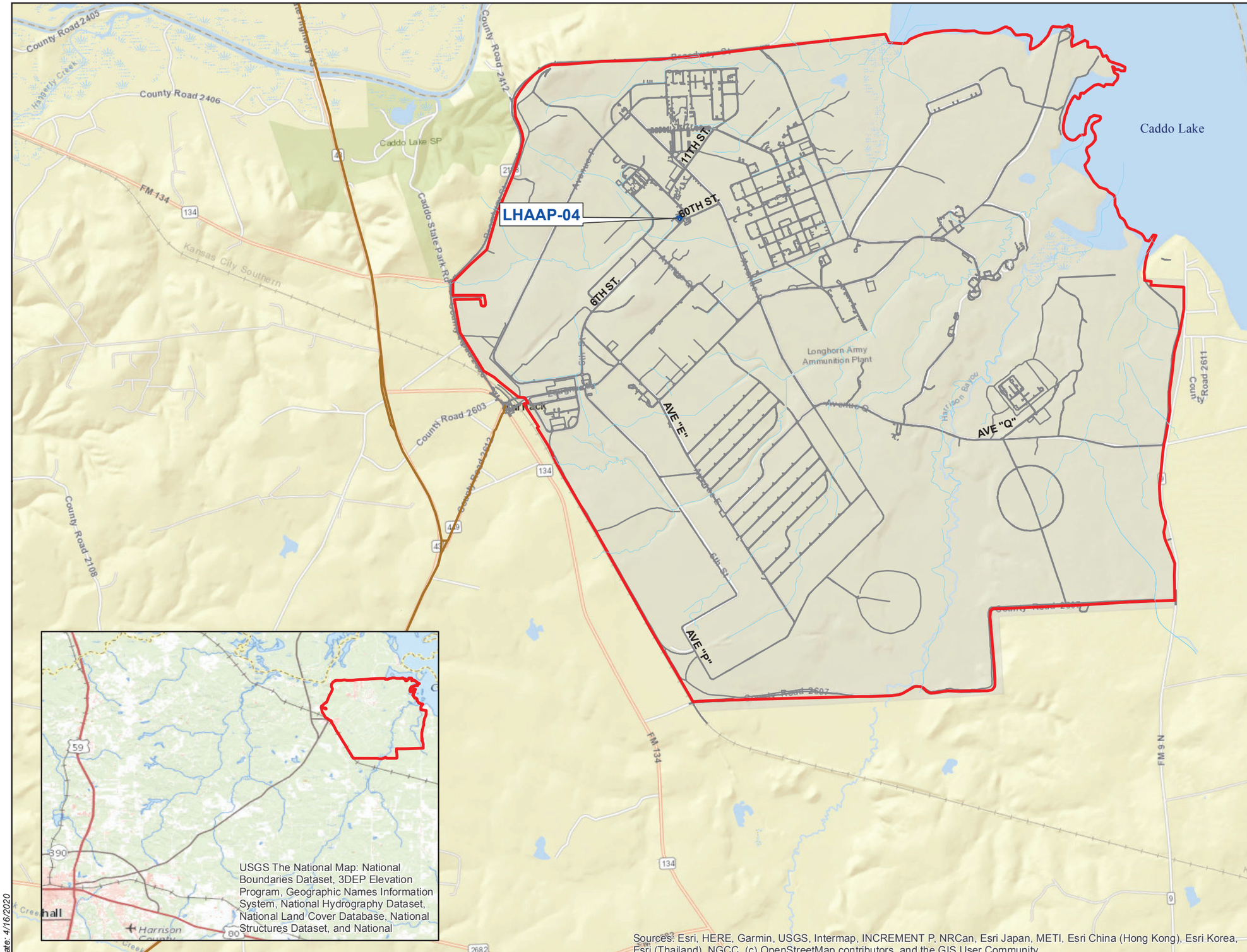
The site addressed in this Final Notice of Land Use Controls is LHAAP-04, which is shown on the attached figures (Figures 1-2 and 1-3 from the Response Action Completion Report) and discussed below. Land Use Controls (LUCs) are applied at LHAAP-04 as part of the remedy in accordance with the LHAAP-04 Record of Decision (ROD) finalized March 30, 2017. The LUCs are necessary because contaminants are present in groundwater at levels that do not support unlimited use and unrestricted exposure. The Final LUC boundary shown is the same as the preliminary boundary that was provided in the Initial Notice of LUCs provided on June 26, 2017.

Contaminants of Concern (COCs)
The only COC identified in the ROD for groundwater at LHAAP-04 was perchlorate, which was found at concentrations exceeding the TCEQ Protective Concentration Levels in the shallow zone.

Land Use Controls

- A LUC prohibiting groundwater use (except for environmental monitoring and testing) shall be implemented and shall remain in place at the site until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.
- A LUC restricting land use to nonresidential shall be implemented and shall remain in place at the site until the levels of COCs in surface and subsurface soil, and groundwater allow for unlimited use and unrestricted exposure.
- A LUC to maintain the integrity of any current or future remedial or monitoring systems shall remain in place until groundwater cleanup levels of COCs are met.

Further information may be found in the Administrative Record at the Marshall Public Library, at www.longhornaap.com or by contacting Rose M. Zeiler (479-635-0110 or rose.m.zeiler.civ@mail.mil).



Stream
Road
LHAAP Boundary
LHAAP-04 Site Boundary

N

0 1,500 3,000 Feet

U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure 1-2

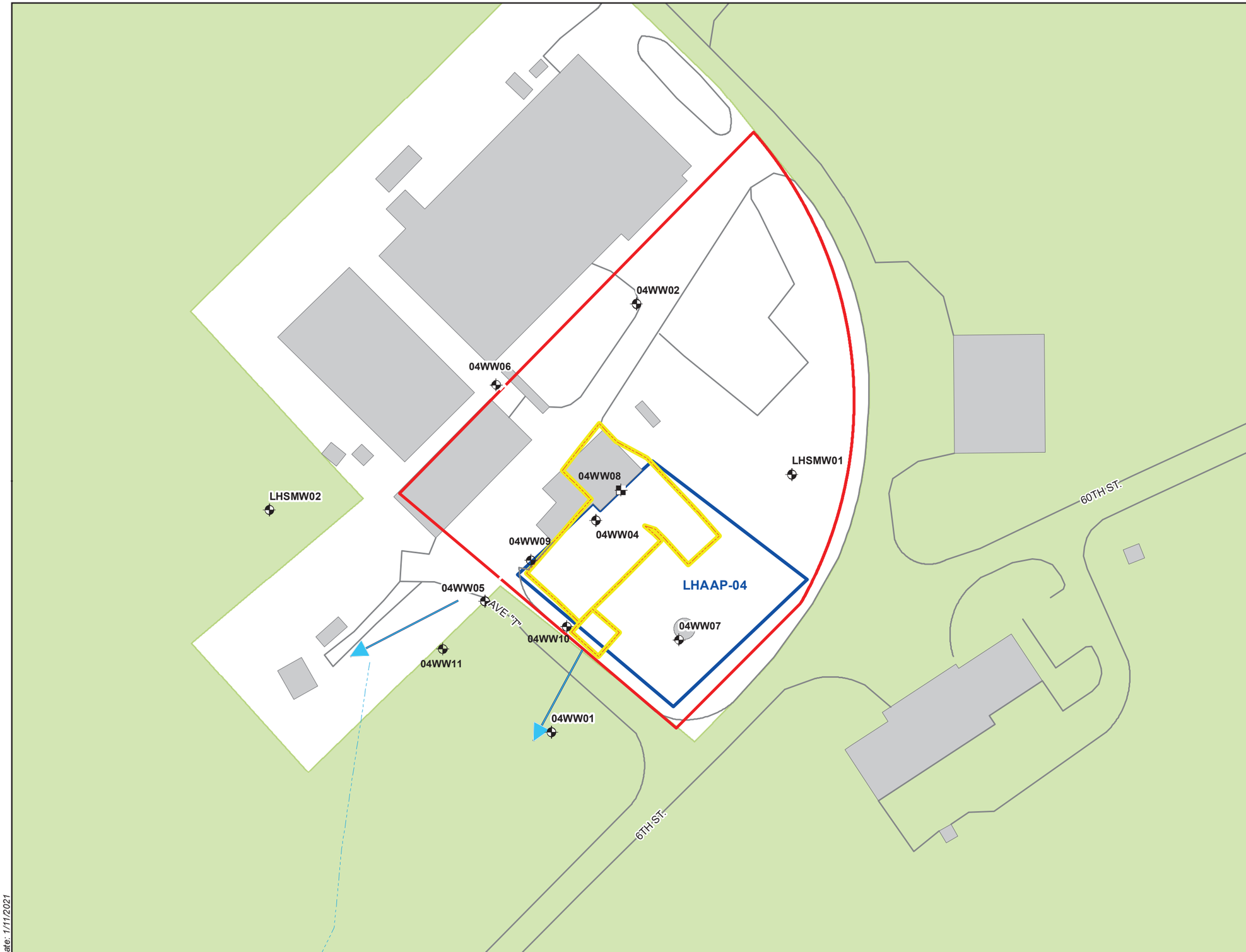
Site Location Map

LHAAP-04
Remedial Action Completion Report

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 4/16/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP04\RACR\Fig1-2_LHAAP_SiteLocationMap.mxd



Shallow Monitoring Well

Groundwater Flow Direction based on January 2019 Potentiometric Contours (Bhate 2019a)

Limits of Excavation at Surface (*Source: LHAAP-04 Final Completion Report, Shaw, 2011*)

Stream

Road

Final LUC Boundary

Building

Site Boundary

National Wildlife Refuge

N

0 35 70 Feet

U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure 1-3

LHAAP-04
Final LUC Boundary Map Remedial Action Completion Report

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 1/11/2021

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP04\RACR\LHAAP04_FinalLUCBoundary.mxd

Land Use Controls for Soil and Groundwater Contamination

Landfill 16 (LHAAP-16)

Longhorn Army Ammunition Plant, Karnack, Texas

The former Longhorn Army Ammunition Plant (LHAAP) is an inactive government-owned, formerly contractor-operated and maintained Department of Defense facility located in central east Texas in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas. The facility is approximately 40 miles west of Shreveport, Louisiana. The former U.S. Army installation occupied nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake and is accessed by State Highways 43 and 134.

LHAAP was placed on the National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the Texas Commission on Environmental Quality [TCEQ]) entered into a CERCLA Section 120 Federal Facilities Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

Land Use Controls (LUCs) are applied at LHAAP-16 as part of the remedy in accordance with the LHAAP-16 Record of Decision signed September 13, 2016. The LUCs are necessary because contaminants are present in groundwater at levels that do not support unlimited use and unrestricted exposure and landfill waste remains at the site under the existing landfill cap.

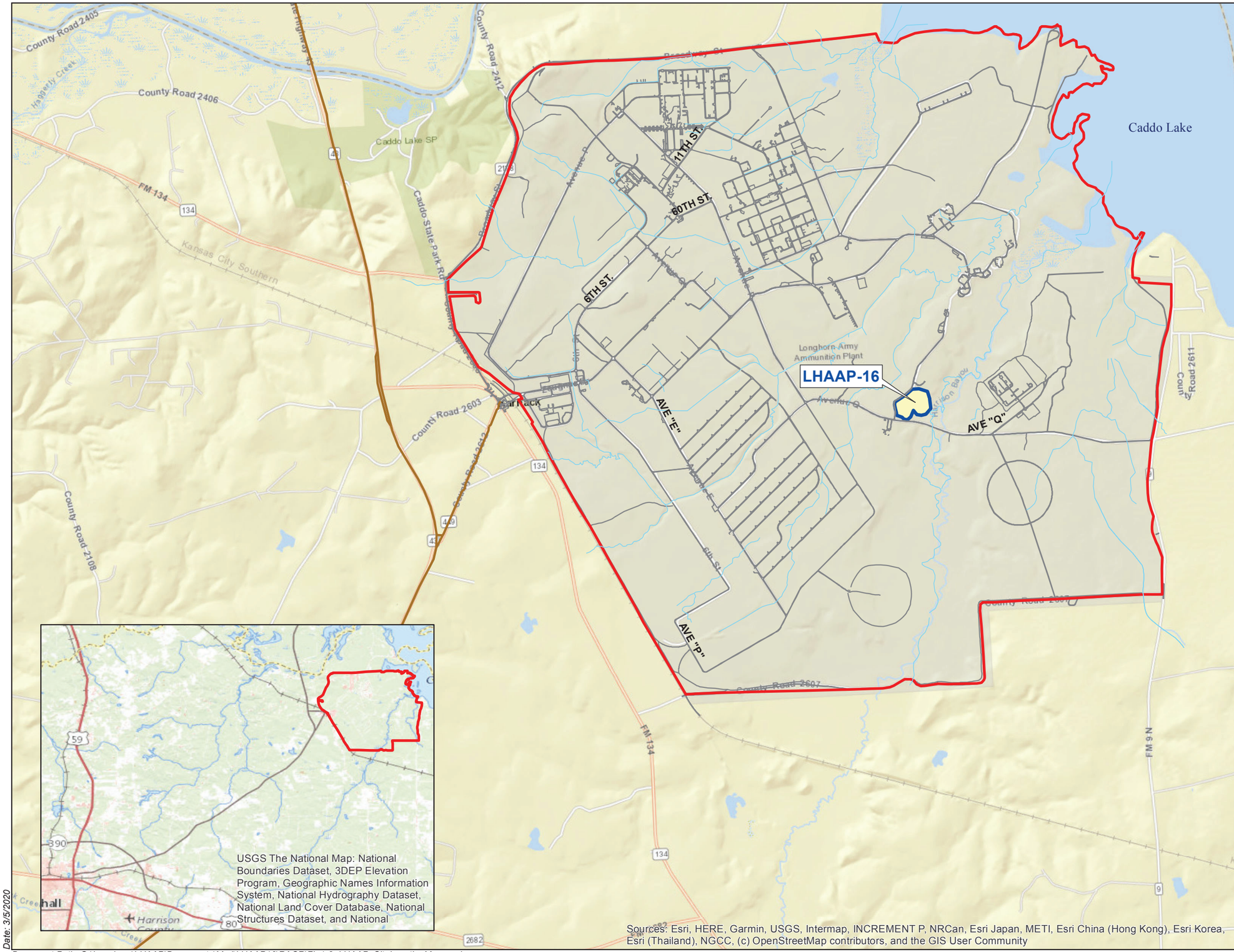
Contaminants of Concern (COCs)

In the shallow and intermediate groundwater zones, the COCs are volatile organic compounds (VOCs) (trichloroethene [TCE], cis-1,2-dichloroethene [DCE], 1,1-DCE, 1,2-dichloroethane, 1,1,2-trichloroethane, methylene chloride, and vinyl chloride [VC]), perchlorate, and five metals (arsenic, chromium, manganese, nickel, and thallium).

Land Use Controls

- The LUC to preserve the integrity of the landfill cap and restrict intrusive activities (e.g., digging) that would degrade or alter the cap shall remain in place as long as the landfill waste remains at the site or until the levels of COCs allow for unlimited use and unrestricted exposure.
- The LUC prohibiting groundwater use (except for environmental monitoring and testing) as a potable source shall be implemented and shall remain in place at the site until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.
- The LUC restricting land use to nonresidential shall be implemented and shall remain in place at the site until the levels of COCs in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure.
- The LUC to maintain the integrity of any current or future remedial or monitoring systems shall remain in place until groundwater cleanup levels of COCs are met.

Further information may be found in the Administrative Record at the Marshall Public Library, at www.longhornaap.com or by contacting Rose M. Zeiler (479-635-0110 or rose.m.zeiler.civ@mail.mil).



Stream
Road
LHAAP Boundary
LHAAP-16 Site Boundary

N

0 1,500 3,000 Feet

U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

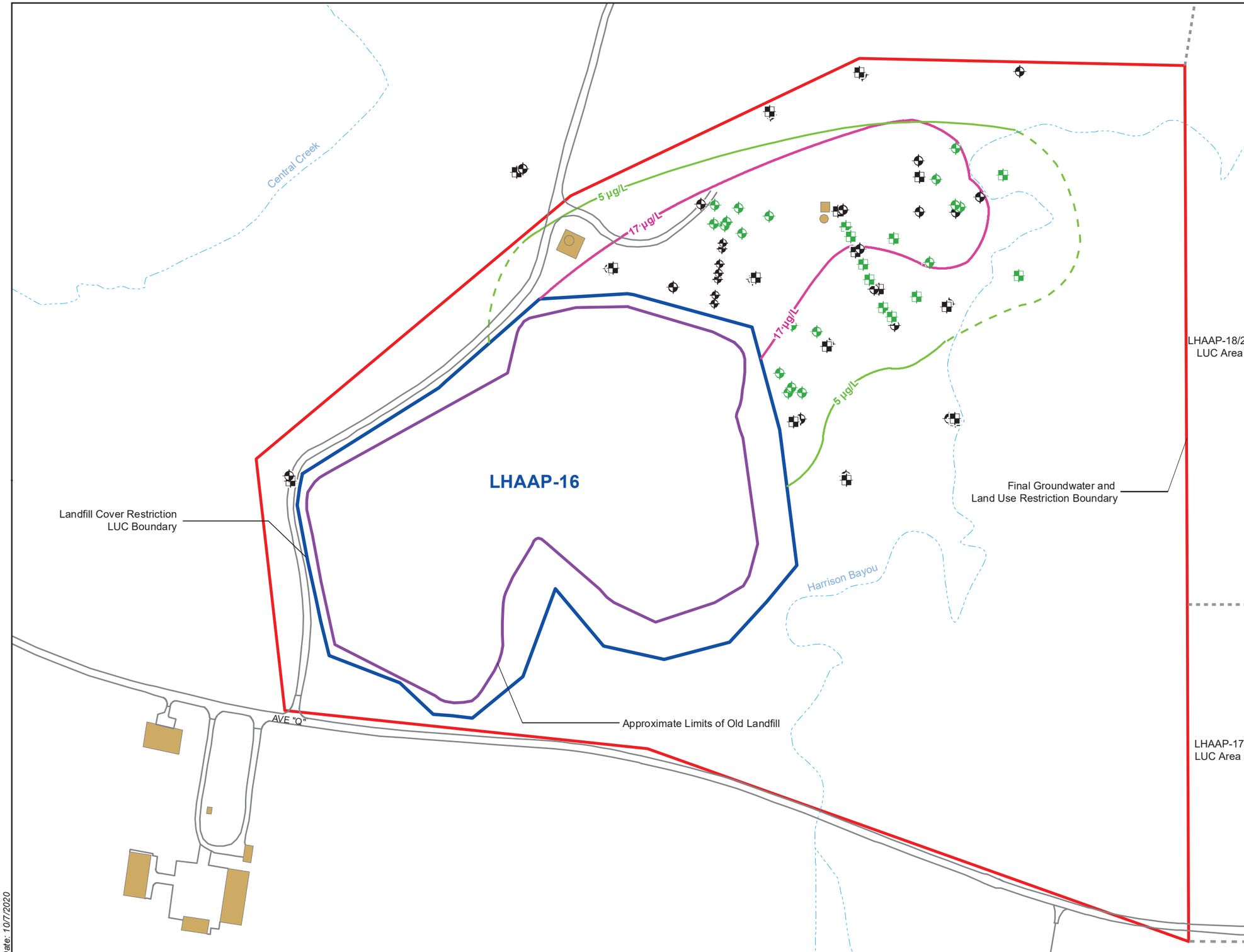
Figure 1-2

LHAAP Site Location Map
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 3/5/2020

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-2_LHAAP_SiteLocationMap.mxd



Shallow Well Installed 2018 or 2019

Intermediate Well Installed 2018 or 2019

Existing Shallow Monitoring Well

Existing Intermediate Monitoring Well

Extent of Perchlorate Contamination > 17 µg/L in Intermediate and Shallow Zones (September 2019)

Extent of TCE Contamination > 5 µg/L in Intermediate and Shallow Zones (Dashed Where Inferred) (September 2019)

Stream

Road

Final Groundwater and Land Use Restriction Boundary

Landfill Cover Restriction LUC Boundary

Approximate Limits of Old Landfill

Building or Tank

LHAAP-17 and LHAAP-18/24 LUC Boundaries

Notes:
1. µg/L - micrograms per liter
2. LUC - land use control
3. TCE - trichloroethene
4. The eastern side of the Final Groundwater and Land Use Restriction Boundary is shared with the western edge of a similar land use restriction that will cover LHAAP-17 and LHAAP-18/24 located to the east of LHAAP-16.

N

0 110 220 Feet

U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure 1-4

Final LUC Boundaries
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 10/7/2020

Document Path: F:\Projects\Longhorn\LHAAP\Documents\Mxd\LHAAP16\RACR\Fig1-4_FinalLUCBoundaries.mxd

Inspection and Maintenance Checklist

General Information	
Project Name	Inspection and Maintenance, LHAAP-16 Landfill, Longhorn Army Ammunition Plant, Karnack, TX
Contractor	
Inspector's Name	
Inspector's Title	
Inspector's Signature	
Inspector's Contact Number	
Inspection Date	
Type of Inspection	☐ Quarterly ☐ Semiannual ☐ Annual ☐ Prior to forecast rain ☐ After a rain event ☐Other ----------

Description		Yes	No	N/A	**Comments** (Attach photos/location sketches)	**Corrective Action** (Attach photos)
A. CAP Cover Surface						
A.1	Are there any significant cracks present?					
A.2.	Are there any damaged areas?					
A.3	Is there any ponded water present?					
A.4	Any other relevant observations?					
B. CAP Vegetation and Animal Burrows						
B.1	Are there signs of stressed/ dead vegetation?					
B.2	Are there any significant bare spots?					
B.3	Are deep-rooted plants present?					
B.4	Are there signs of animal burrows?					
B. 5	Any other relevant observations?					

Description		Yes	No	N/A	**Comments** (Attach photos/location sketches)	**Corrective Action** (Attach photos)
C. CAP Erosion and Drainage System						
C.1	Is there any evidence of significant/ clearly visible erosion, settlement, or other deterioration?					
C.2	Are the drainage systems in poor condition?					
C.3	Is there excessive silting or debris clogging?					
C.4	Is there erosion of banks and slopes?					
C.5	Are there areas of choking by overgrown vegetation?					
C.7	Is there pooling of water in or along side a channel or berm?					
C.8	Any other relevant observations?					
D. Groundwater Monitoring Wells						
D.1	Are the installed groundwater monitoring wells in poor condition?					
D.2	Are there any signs of damage, unusual wear, rust and corrosion, vandalism, unauthorized entry/use, or settlement?					
D.3	Is well cap and/or locking mechanism not properly functioning?					
D.4	Are the well heads and protective casings damaged?					
D.5	Is the well cleared of vegetation and accessible?					
D.6	Any other relevant observations?					

Description		Yes	No	N/A	**Comments** (Attach photos/location sketches)	**Corrective Action** (Attach photos)
E. Site Access Features						
E.1	Are the perimeter fence and gates damaged?					
E.2	Gate(s) damaged?					
E.3	Litter encountered within the area?					
E.4	Are the gate locks missing?					
E.4	Are signs to prevent unauthorized entry missing?					
E.5	Are the access roads in unusable or poor condition?					
E.6	Any other relevant observations?					
F. Concrete Aprons and Bollards						
F.1	Are there any significant cracks present?					
F.2	Are there any damaged areas?					
F.3	Any other relevant observations?					

Annual Land Use Control Compliance Inspection Form

In accordance with the Remedial Design dated _____ for LHAAP-16 an inspection of the site was conducted by _____ [indicate transferee] on _____.

The land use control mechanisms are:

- Groundwater restrictions - prohibit access to the contaminated groundwater except for environmental monitoring and testing only until cleanup goals are met;
- Landfill integrity - preserve the integrity of the landfill cap and restrict intrusive activities (e.g., digging) that would degrade or alter the cap;
- Land use restrictions - restrict land use to nonresidential;
- Integrity of remedial and monitoring systems - maintain the integrity of any current or future remedial or monitoring systems until cleanup goals are met.

No unauthorized activities or uses have occurred. Compliance with land use controls and restrictions is as follows:

- No use of groundwater (other than environmental testing and monitoring), installation of new groundwater wells, or tampering with existing monitoring wells;
- No landfill intrusive activities (e.g., digging) that would degrade or alter the landfill cap; maintenance of vegetative cover and repair of soil subsidence or erosion areas on the cap;
- No land use other than nonresidential; and
- No activities that would compromise the integrity of the remedial or monitoring systems.

I, the undersigned, do document that the inspection was conducted as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year, retained in the file and provided to Army, EPA and TCEQ upon request.

Appendix B

Well Information

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
16IW25	6953777.99	3314293.02	199.24	196.29
16IW26	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
LHSMW23R	6962446.72	3306461.39	208.84	205.75
16RW02	6953440.13	3314139.68	182.97	179.94

STATE OF TEXAS
REGISTERED
DAVID R. COLLINS, JR.
6488
PROFESSIONAL
LAND SURVEYOR

DAVID R. COLLINS, JR. R.P.L.S.#6488
SURVEY DATE: MARCH 31, 2020

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW09
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/31/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953396.09
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314160.35

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

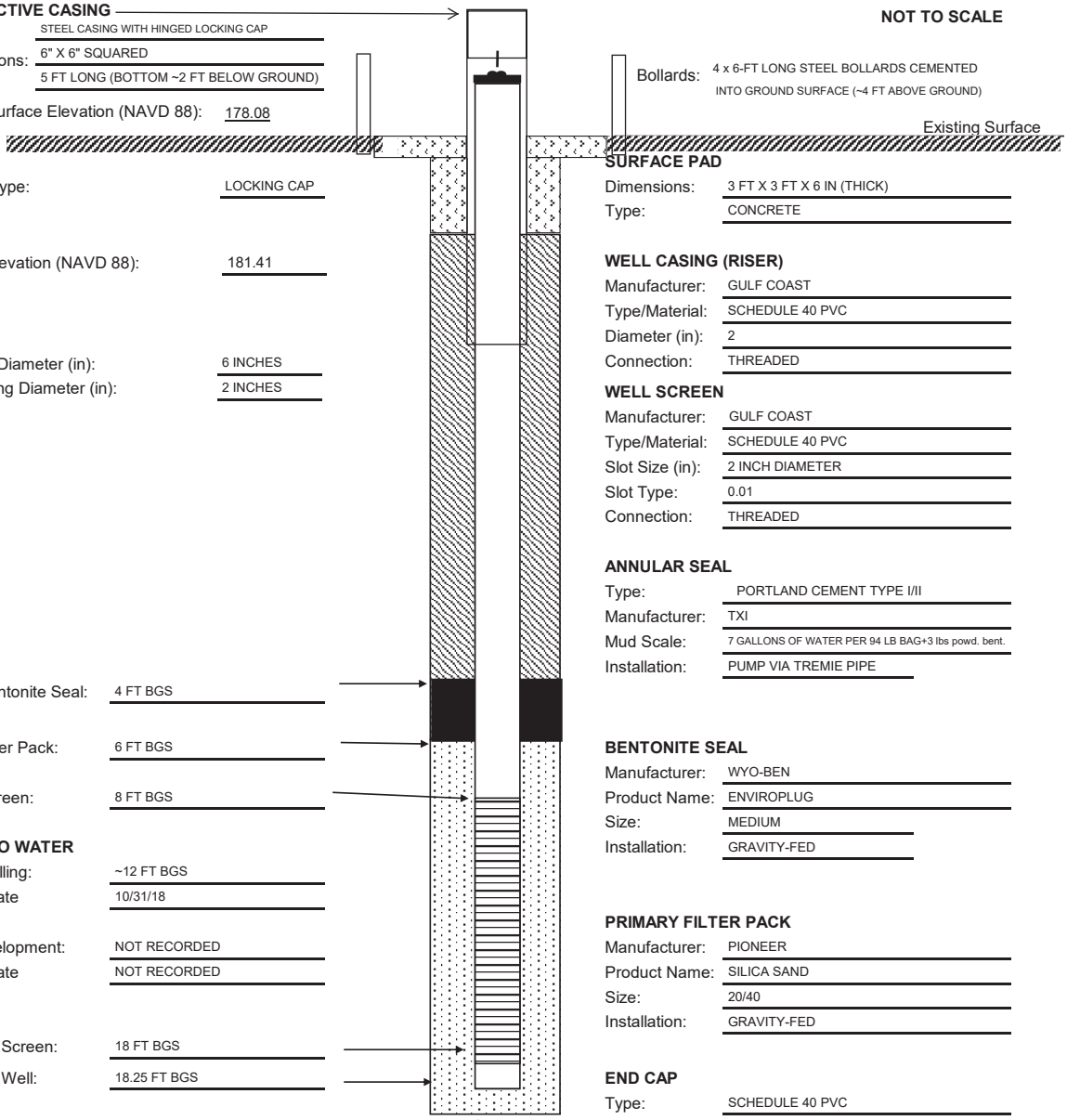
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 178.08

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 181.41

Borehole Diameter (in): 6 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 4 FT BGS

Top of Filter Pack: 6 FT BGS

Top of Screen: 8 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 10/31/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 18 FT BGS

Bottom of Well: 18.25 FT BGS

Borehole Depth: 20

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW09
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 10/30/2018
Ended: 10/30/2018

Drilling Co.: ETTL
Drill Rig Model: Diedrich B-50
Driller: Pedro Gonzales
Drlling Method: Hollow-Stem Auger
Hole Diameter: 6 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 12.8 ft bgs on 30-Oct-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
										See Boring Log for RW-03. Due to method of drilling low recovery at this location.	set well at 18 ft btoc. See Well Diagram for details.
						5					
						10					
						15					
						20				**Boring was terminated at approximately 20 feet bgs.**	
						25					
						30					

Project No.:
Location: ,

Boring/Well ID: 16IW09
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW10
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/25/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953780.74
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314013.26

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

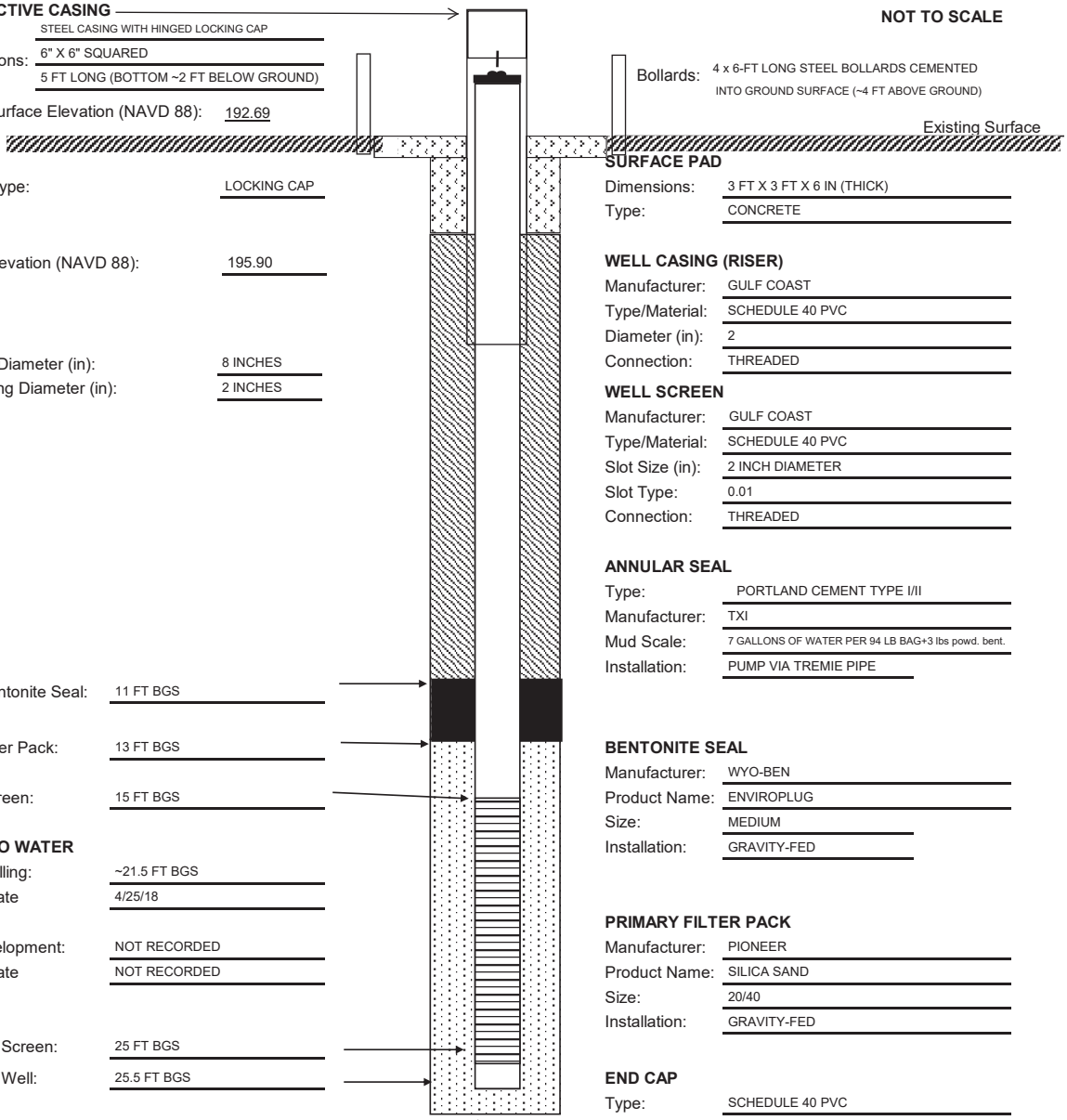
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 192.69

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 195.90

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 11 FT BGS

Top of Filter Pack: 13 FT BGS

Top of Screen: 15 FT BGS

DEPTH TO WATER

During Drilling: ~21.5 FT BGS

Date: 4/25/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 25 FT BGS

Bottom of Well: 25.5 FT BGS

Borehole Depth: 25.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW10
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/25/2018
Ended: 4/25/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 8 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 21.5 ft bgs on 25-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
1530		0.0						ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
1537		0.1									
					5						
1542		0.2									
1546		0.1						ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry to moist; soft; alternates silty sand to sandy clay. With no to low plasticity.		
					10			CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
1552		0.1									
								ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
1600		0.1						CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
					15						
1606		0.0						SM	**SILTY SAND**; light brown (7.5YR 6/4); dry; loose; some fines.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
1613		0.0									
					20						
1617		0.0									
								SM	**SILTY SAND**; light brown (7.5YR 6/4); moist to wet; loose; some fines.		Used Pioneer silica sand 20/40
1622		0.0									
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
					25						
									Boring was terminated at approximately 25.5 feet bgs.		Set well at 25.3; Screened from 15 to 25 ft bgs
					30						

Project No.:
Location: ,

Boring/Well ID: 16IW10
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW20
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/3/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953823.60
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314557.01

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

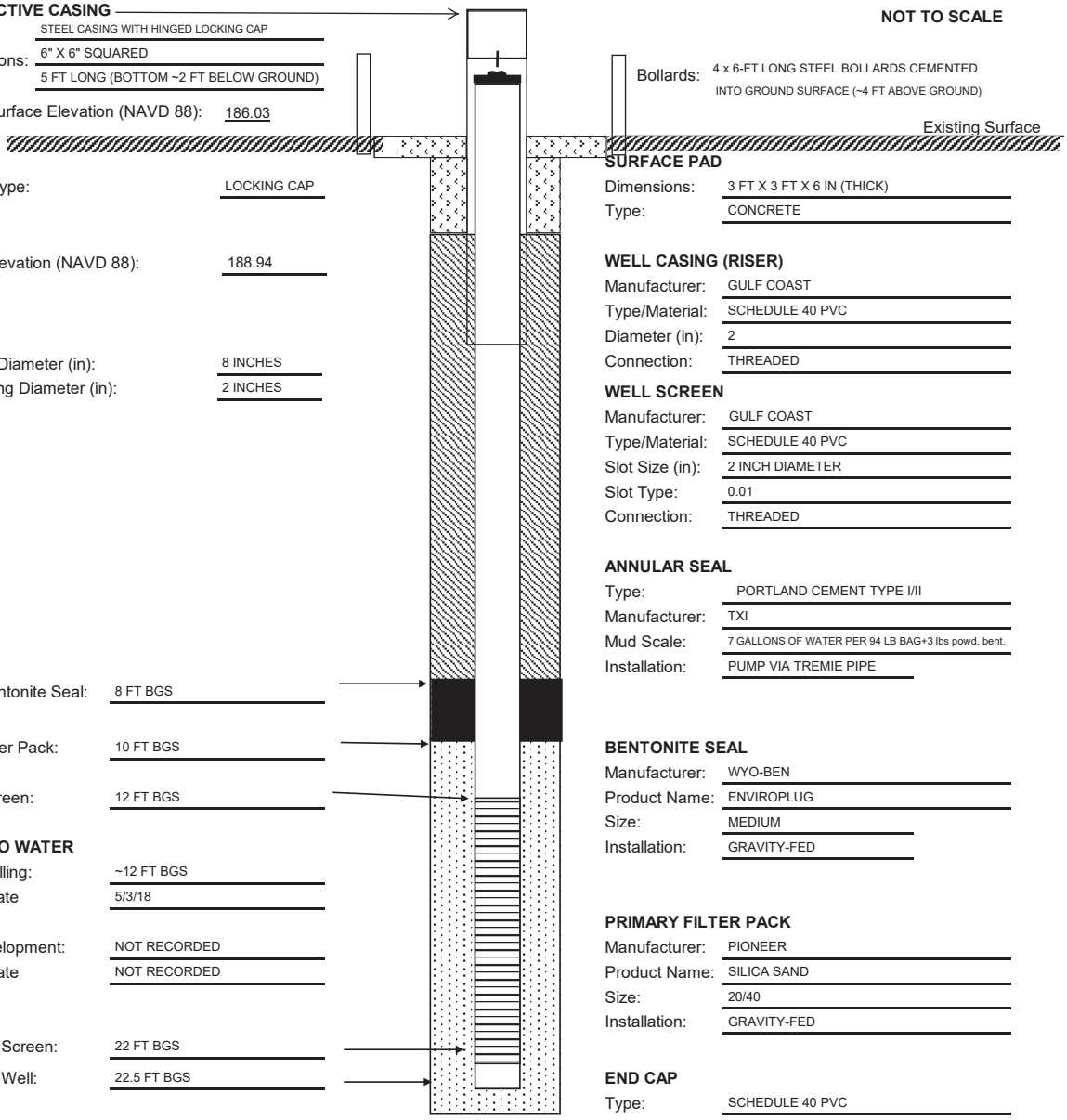
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 186.03

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 188.94

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 8 FT BGS

Top of Filter Pack: 10 FT BGS

Top of Screen: 12 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 5/3/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 22 FT BGS

Bottom of Well: 22.5 FT BGS

Borehole Depth: 22.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

BORING LOG

Boring/Well ID: 16IW20
Sheet: 1 **of** 1

Project No.: 501032
Client: USACE
Location: LONGHORN AAP, SITE 16
Started: 5/3/2018
Ended: 5/3/2018

Drilling Co.: Best Drilling Services, Inc
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 8 **(inches)**

Logged By: Allen Willmore
Edited By:
Checked By: G.N.Jones
Number:

First Water: 12 ft bgs on 03-May-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
		01							CH	**SILTY FAT CLAY** ; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
		04										
		04				5						Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
		06										
		02				10			ML-SM	**SILTY SAND WITH CLAY** ; reddish yellow (7.5YR 6/8); dry; medium dense; iron staining; browish red.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
		02							SM	**SILTY SAND WITH CLAY** ; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.		
		02				15						
		04							CL-ML	**CLAYEY SILT WITH SAND** ; very pale brown (10YR 7/4); moist; soft; more clay content than above.		Used Pioneer silica sand 20/40
		0		NR		20			CL-ML	**SILTY FAT CLAY WITH SAND** ; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; organic content.		Little Recovery, clay seen in shoe.
										Boring was terminated at approximately 22.5 feet bgs.		Set well at 22.5 ft bgs; set screen 12' bgs to 22' bgs
						25						
						30						

Project No.:
Location: ,

Boring/Well ID: 16IW20
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW25
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/1/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953777.99
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314293.02

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

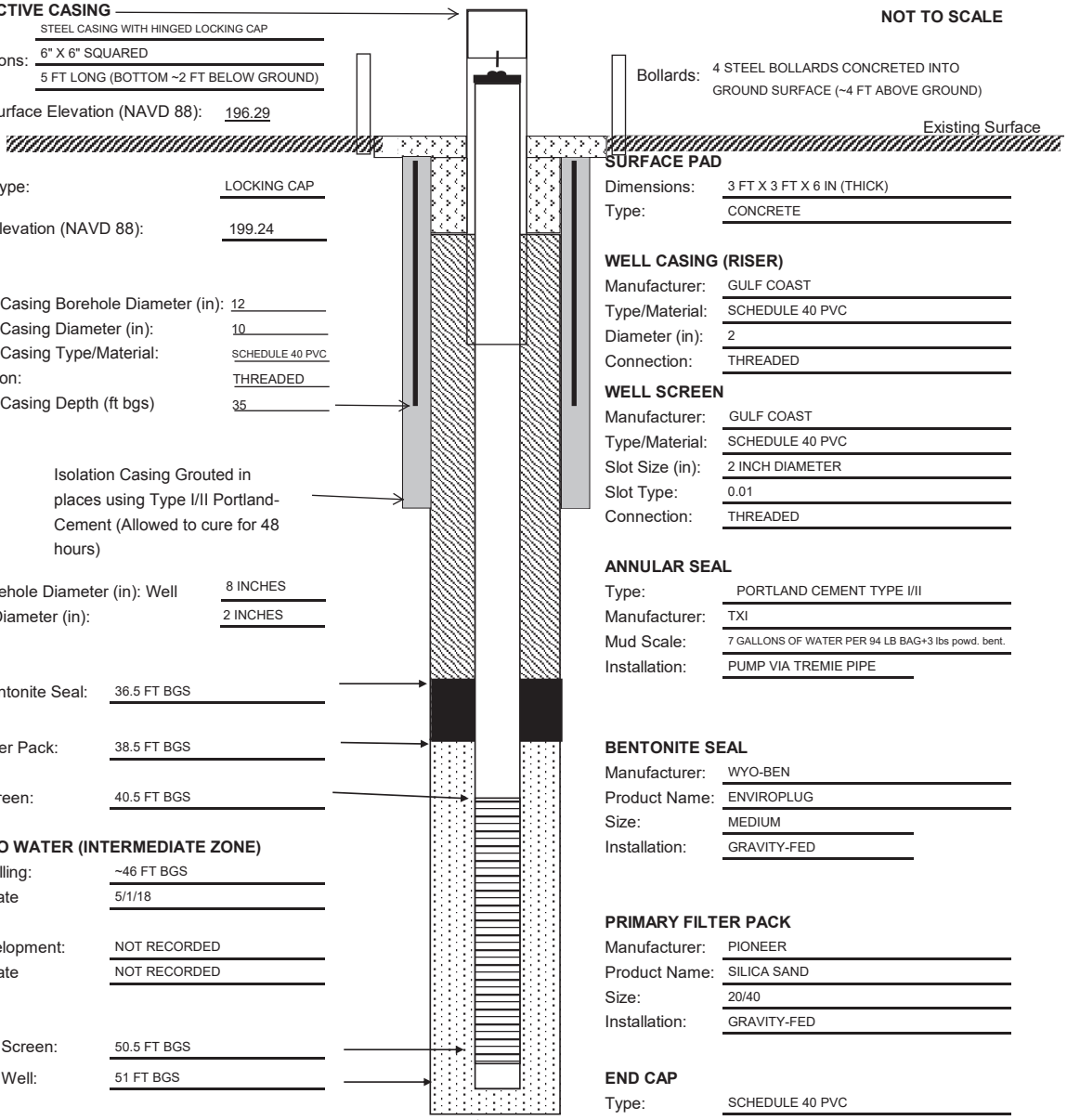
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 196.29

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 199.24

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 35

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 36.5 FT BGS

Top of Filter Pack: 38.5 FT BGS

Top of Screen: 40.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~46 FT BGS

Date 5/1/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 50.5 FT BGS

Bottom of Well: 51 FT BGS

Borehole Depth: 55

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW25
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/23/2018
Ended: 5/1/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 46 ft bgs on 23-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
1250		0						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
1255		0								
					5					
1300		0								
								SM	**SILTY SAND WITH CLAY**; reddish yellow (7.5YR 6/8); dry; very dense; iron staining; browish red.	
1305		0								
					10			CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; iron staining.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
1310		0						SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); dry to moist; loose to medium dense; alternates silty sand to sandy clay; brownish red.	
1315		0								
					15			CL	**SILTY CLAY** ; light brown (7.5YR 6/4); dry; firm; with high plasticity.	
1320		0.2								
								SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.	
1325		0								
					20					
1345		0.3								
1400		0							-coarsens downward, becomes more sandy.	
					25					
1404		0							Wet; -becomes saturated.	
1410		0.2								
					30					

Project No.:
Location: ,

Boring/Well ID: 16IW25
Sheet: 1 **of** 2

APTIM

BORING LOG

Boring/Well ID: 16IW25
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
1420		0								
1440		0.1						CH	**SILTY CLAY** ; dry to moist; firm; mostly fines with high plasticity.	
		0.1			35					Set Isolation Casing at 35 ft bgs No recovery from 35 to 48 ft. Driller suspects sand at 46 ft
		0.1			40					
		0.0			45					
								SP-SM	**SILTY SAND** ; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	
					50			CH	**FAT CLAY** ; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 49' bgs. Screen from 40.5 to 50.5
					55				**Boring was terminated at approximately 55 feet bgs.**	See well diagram for details
					60					

Project No.:
Location: ,

Boring/Well ID: 16IW25
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW26
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/2/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953754.86
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314304.29

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

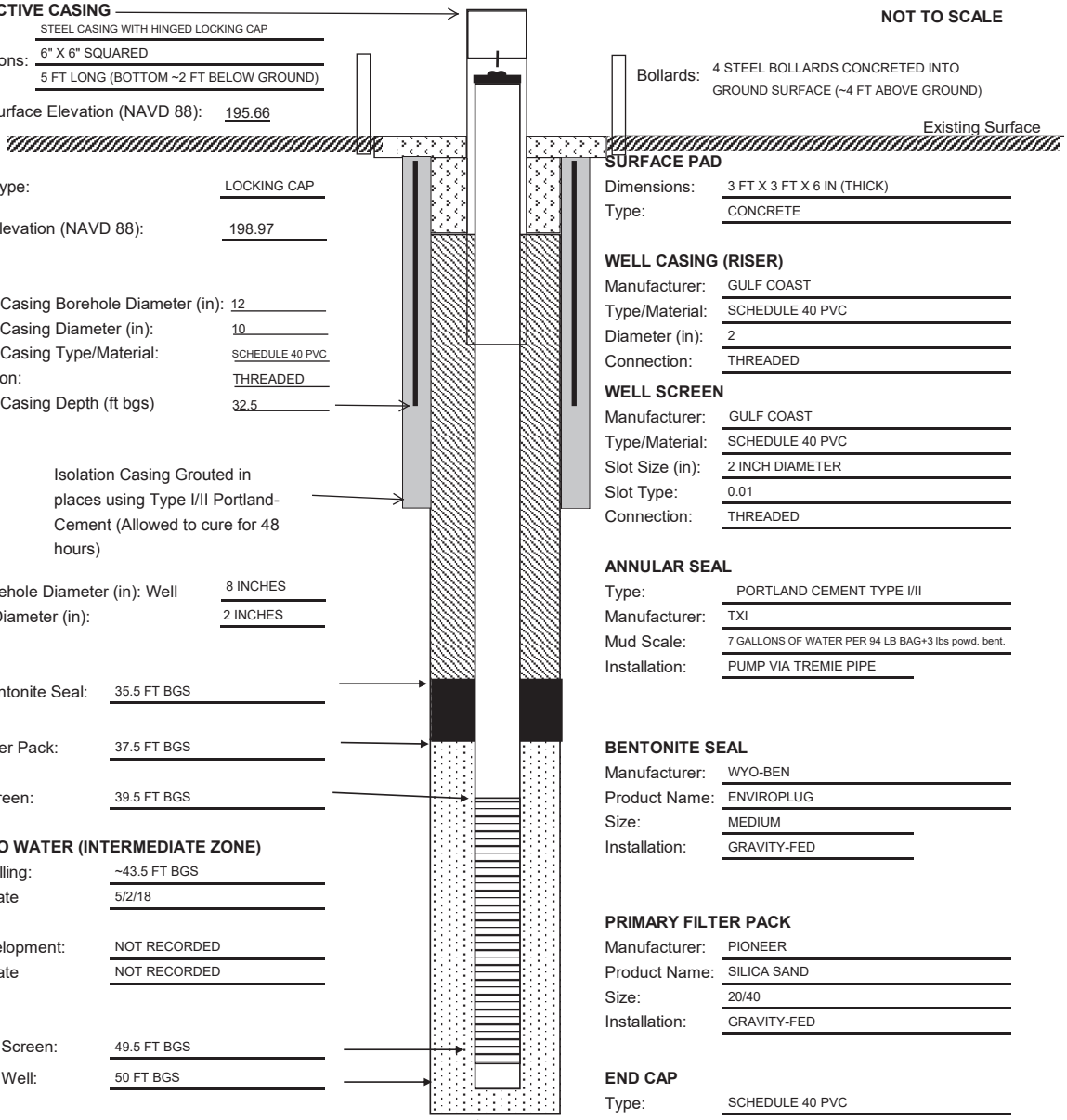
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 195.66

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 198.97

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 32.5

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 35.5 FT BGS

Top of Filter Pack: 37.5 FT BGS

Top of Screen: 39.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~43.5 FT BGS

Date 5/2/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 49.5 FT BGS

Bottom of Well: 50 FT BGS

Borehole Depth: 50

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW26
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/24/2018
Ended: 5/2/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 43.5 ft bgs on 24-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
0800		0						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
0805		0								
					5					
0810		0						ML-SM	**SILTY SAND WITH CLAY**; reddish yellow (7.5YR 6/8); moist; medium dense; iron staining; browish red.	
0820		0								
					10					
0825		0.3								
0832		0								
					15					
0840		0						CL-ML	**SILTY FAT CLAY WITH SAND**; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; organic content. More sand content, becomes soft.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
0851		1.4						SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.	
					20					
0900		0						CL-ML	**CLAYEY SILT WITH SAND**; very pale brown (10YR 7/4); moist; soft; -coarsens downward, becomes more sandy.	
0905		0.5								
					25					
0912		0								
0920		0.9						CH	**SILTY CLAY**; light brown (7.5YR 6/4); dry to moist; firm; mostly fines with high plasticity.	
					30					

APTIM

BORING LOG

Boring/Well ID: 16IW26
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
0928		0						CH	**SILTY CLAY**; light brown (7.5YR 6/4); dry to moist; firm; mostly fines with high plasticity.	
		0.7			35					Set Isolation Casing at 32.5 ft bgs
		0.6			40					
		0.3			45			SP-SM	**SILTY SAND**; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; saturated.	Very little recovery, contact difficult to determine
					50			CH	**FAT CLAY**; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 50' bgs. Screen from 39.5 to 49.5
									Boring was terminated at approximately 50 feet bgs.	See well diagram for details
					55					
					60					

Project No.:
Location: ,

Boring/Well ID: 16IW26
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW27
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/2/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953691.80
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314332.92

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

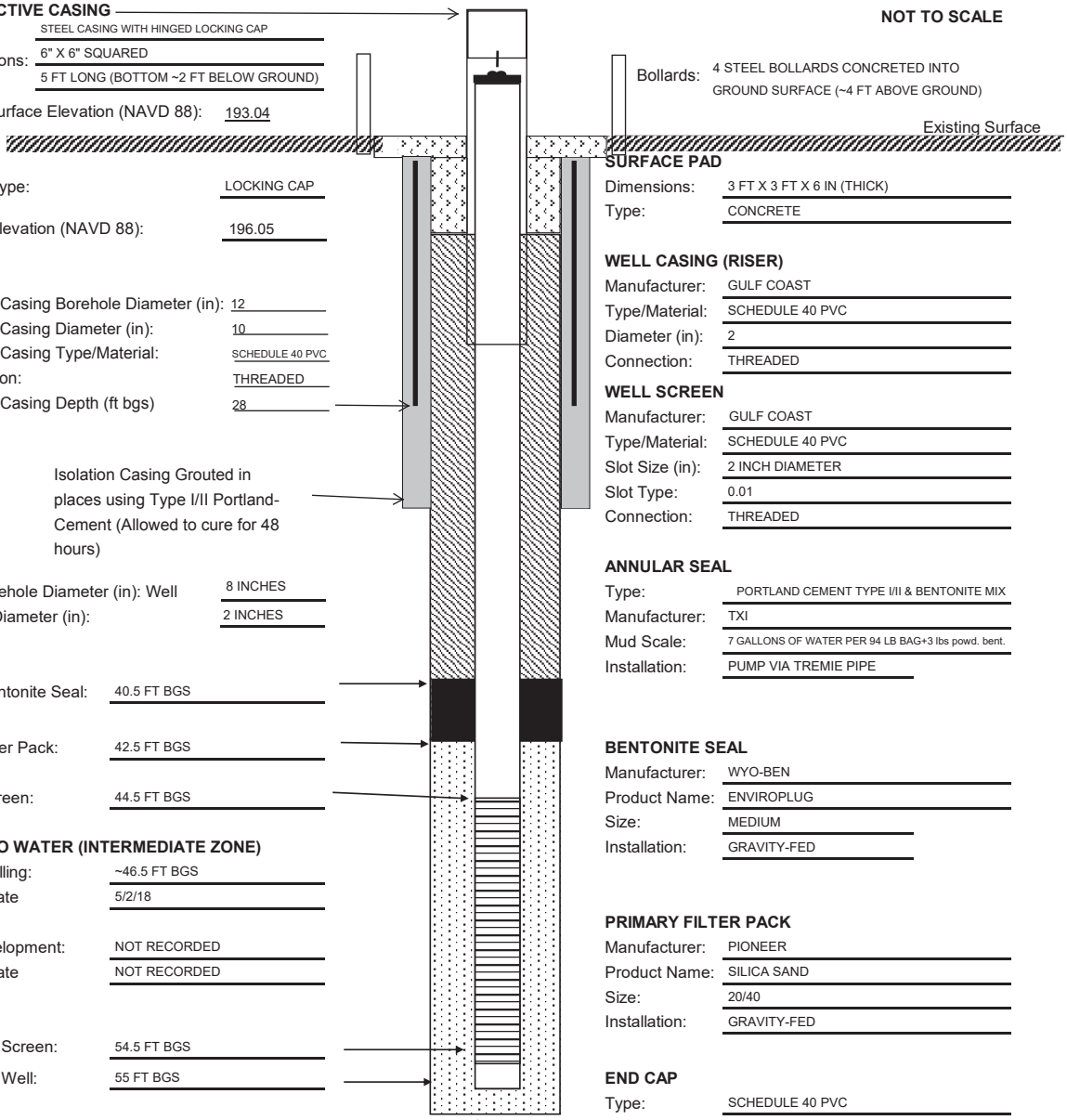
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 193.04

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 196.05

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 28

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 40.5 FT BGS

Top of Filter Pack: 42.5 FT BGS

Top of Screen: 44.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~46.5 FT BGS

Date 5/2/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 54.5 FT BGS

Bottom of Well: 55 FT BGS

Borehole Depth: 55

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II & BENTONITE MIX

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW27
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/25/2018
Ended: 5/2/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 46.5 ft bgs on 25-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
1605		0						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
1610		0								
					5					
1615		0								
								ML-SM	**SILTY SAND WITH CLAY**; reddish yellow (7.5YR 6/8); moist; medium dense; iron staining; browish red.	
1620		0								
								CL-ML	**SILTY FAT CLAY WITH SAND**; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; organic content.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
					10					
1625		0								
1630		0								
					15					
1635		0								
								SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.	
1640		1.2								
					20					
1645		1.7								
1650		2.4								
								CL-ML	**CLAYEY SILT WITH SAND**; very pale brown (10YR 7/4); moist; soft; -coarsens downward, becomes more sandy.	
					25					
1655		0.9								
1700		3.1						CH	**SILTY CLAY** ; light brown (7.5YR 6/4); dry to moist; firm; mostly fines with high plasticity.	Set isolation Casing at 28 ft bgs
					30					

APTIM

BORING LOG

Boring/Well ID: 16IW27
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		2.1								
					35					
		0.1								
					40					
		3.2								
					45					
		1.2								
								SP-SM	**SILTY SAND**; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	No recovery from 35 to 48 ft. Driller suspects sand at 46 ft
					50					
		0.1								
					55			CH	**FAT CLAY**; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 55' bgs. Screen from 44.5 to 54.5
									Boring was terminated at approximately 55 feet bgs.	See well diagram for details
					60					

Project No.:
Location: ,

Boring/Well ID: 16IW27
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW28
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/1/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953655.99
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314347.06

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

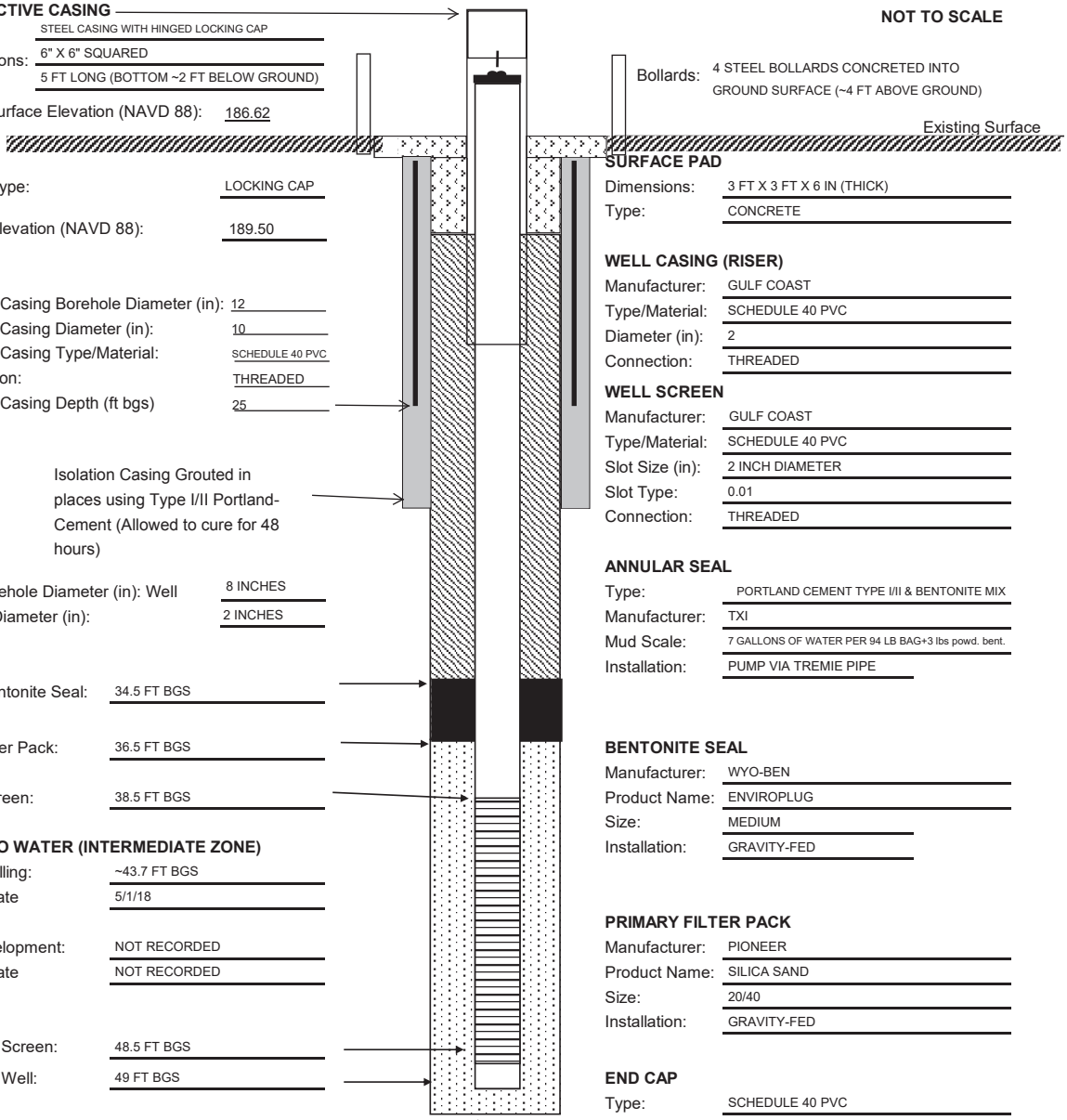
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 186.62

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 189.50

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 25

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 34.5 FT BGS

Top of Filter Pack: 36.5 FT BGS

Top of Screen: 38.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~43.7 FT BGS

Date 5/1/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 48.5 FT BGS

Bottom of Well: 49 FT BGS

Borehole Depth: 50

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II & BENTONITE MIX

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW28
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/18/2018
Ended: 5/1/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 43.7 ft bgs on 18-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
1127		0.2						CH	**SILTY FAT CLAY**; dry; soft to firm; mostly fines with high plasticity; iron staining, reddish-brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
1131		0.4								
								SM	**SILTY SAND WITH CLAY**; dry; very dense; iron staining; brownish red.	
					5			CH	**SILTY FAT CLAY**; dry; hard; mostly fines with medium plasticity; iron staining.	
1148		0.4								
1153		0.6								
								ML-SM	**SANDY ELASTIC SILT WITH CLAY**; dry to moist; soft to firm; alternates silty sand to sandy clay; brownish red.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
					10					
1157		1.4						CL	**SILTY CLAY**; dry; firm; with high plasticity.	
								SM	**SILTY SAND**; moist; dense; some fines.	
1204		2.1						CL	**SILTY CLAY**; dry; firm; with high plasticity.	
					15			SM	**SILTY SAND**; moist; dense; some fines. Moist to wet; ~15 ft. becomes moist to wet, difficult to determine exact depth.	
1211		2.1								
1215		2.8								
					20					
1225		0.9						CH	**SILTY CLAY**; dry; firm; mostly fines with high plasticity.	
1230		0.3								
					25					
		0.1								Set Isolation Casing set at 25' bgs
					30					

APTIM

BORING LOG

Boring/Well ID: 16IW28
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		0.3								
					35					
		0.2								
					40					
		0.4								
								SP-SM	**SILTY SAND**; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	
					45					
		0.2								
								CH	**FAT CLAY**; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 49' bgs. Screen from 38.5 to 48.5
					50					See well diagram for details
									Boring was terminated at approximately 50 feet bgs.	
					55					
					60					

Project No.:
Location: ,

Boring/Well ID: 16IW28
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW29
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/1/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953590.95
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314379.27

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

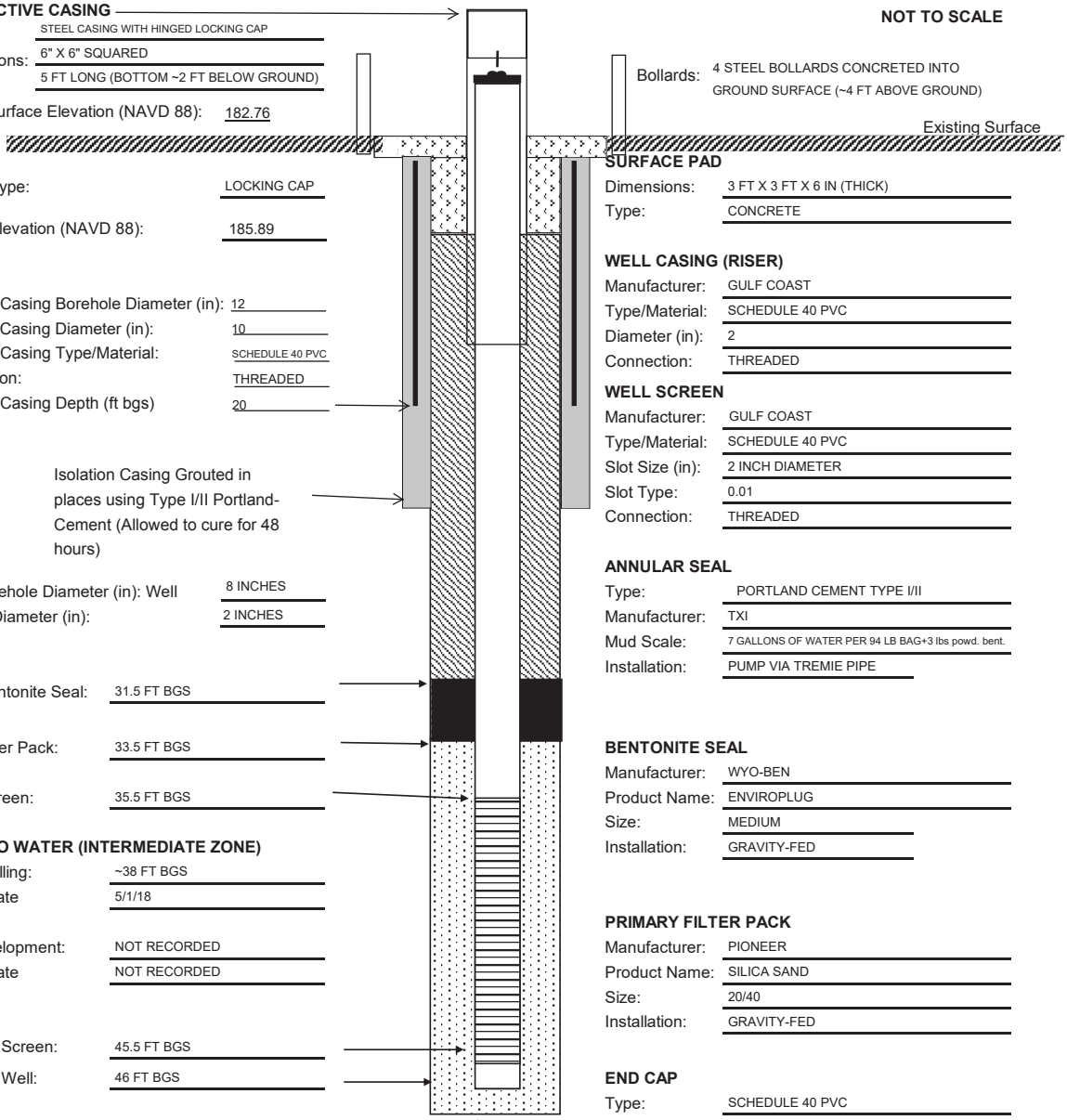
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 182.76

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 185.89

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 20

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 31.5 FT BGS

Top of Filter Pack: 33.5 FT BGS

Top of Screen: 35.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~38 FT BGS

Date 5/1/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 45.5 FT BGS

Bottom of Well: 46 FT BGS

Borehole Depth: 47.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW29
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/17/2018
Ended: 5/1/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 38 ft bgs on 17-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
1420		1.2						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining, reddish-brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
1428		0.4								
					5					
1436		0.6						SM	**SILTY SAND WITH CLAY**; dry; very dense; iron staining; brownish red.	
								CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining.	
1444		1.2						SM	**SILTY SAND WITH CLAY**; dry to moist; soft to firm; alternates silty sand to sandy clay; brownish red.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
					10					
1452		3.1								
1455		2.9								
								SM	**SILTY SAND**; wet; loose; some fines.	
					15					
1457		0.5						CL	**SILTY CLAY**; dry; firm; with high plasticity.	
1504		0.1								
					20					
		0.6								Set Isolation Casing at 20 ft bgs
					25					
		1.2								
					30					

APTIM

BORING LOG

Boring/Well ID: 16IW29
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		0.9								
					35					
		0.3								
								SP-SM	**SILTY SAND**; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	
					40					
		2.1								set bottom of well at 46' bgs. Screen from 35.5 to 45.5
					45					
		1.0						CH	**PEAT**; black (2.5Y 2.5/1); wet; organic.	
									FAT CLAY; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	
									Boring was terminated at approximately 47.5 feet bgs.	See well diagram for details
					50					
					55					
					60					

Project No.:
Location: ,

Boring/Well ID: 16IW29
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16IW30
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/30/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953570.27
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314398.21

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

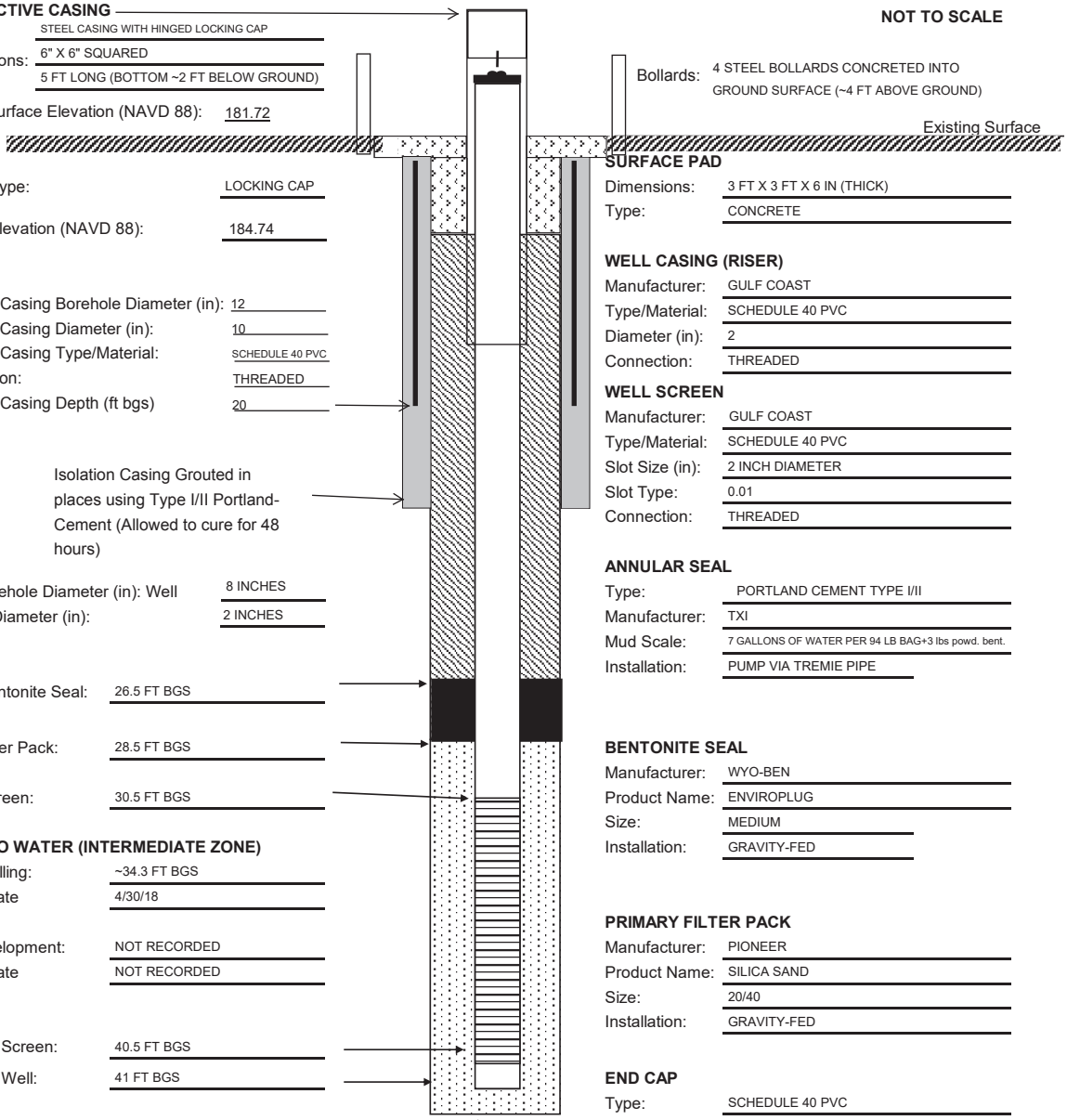
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 181.72

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 184.74

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 20

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 26.5 FT BGS

Top of Filter Pack: 28.5 FT BGS

Top of Screen: 30.5 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~34.3 FT BGS

Date 4/30/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 40.5 FT BGS

Bottom of Well: 41 FT BGS

Borehole Depth: 42

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16IW30
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/18/2018
Ended: 4/30/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 34.3 ft bgs on 18-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
0830		0.3							ML	**SANDY SILT**; moist; soft.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
0835		0.4							CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.	
0841		0.2				5					
0848		0.0							SM	**SILTY SAND WITH CLAY**; dry; very dense; iron staining; browish red.	
0856		0.5				10			CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
0905		0.6							SM	**SILTY SAND WITH CLAY**; dry to moist; soft to firm; alternates silty sand to sandy clay; brownish red. Wet; -Becomes Wet.	
0915		0.2				15			CH	**SILTY CLAY**; greenish gray (5BG 5/1); dry; firm; with high plasticity; -Becomes dry.	Set Isolation Casing at 20 ft bgs
0918		0.2									
		0.2				20					
		0.5				25					
						30					

Project No.:
Location: ,

Boring/Well ID: 16IW30
Sheet: 1 **of** 2

APTIM

BORING LOG

Boring/Well ID: 16IW30
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		0.1								-Becomes softer, more plasticity.	
						35			SP-SM	**SILTY SAND** ; greenish gray (5BG 5/1); moist to wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	
		0.1								-Saturated.	heaving sands at ~36 ft bgs. Drill rods get stuck
						40					
		0.1							CH	**PEAT** ; black (2.5Y 2.5/1); wet; organic.	
										FAT CLAY ; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 41' bgs. Screen from 30.5 to 40.5 See well diagram for details
										Boring was terminated at approximately 42 feet bgs.	
		0.1				45					
						50					
						55					
						60					

Project No.:
Location: ,

Boring/Well ID: 16IW30
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW01
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/31/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953551.08
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314168.77

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

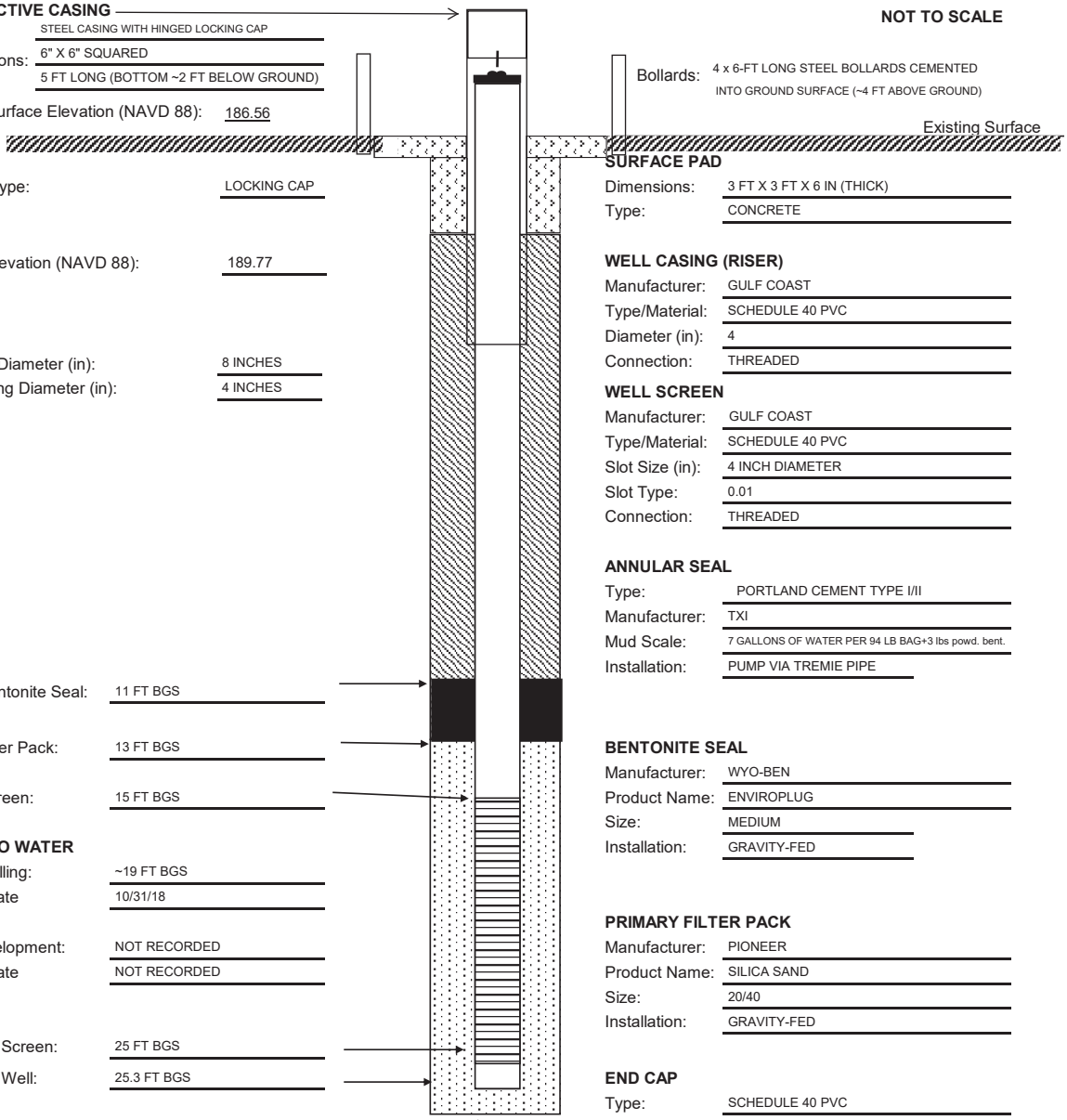
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 186.56

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 189.77

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 11 FT BGS

Top of Filter Pack: 13 FT BGS

Top of Screen: 15 FT BGS

DEPTH TO WATER

During Drilling: ~19 FT BGS

Date: 10/31/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 25 FT BGS

Bottom of Well: 25.3 FT BGS

Borehole Depth: 26

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW01
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 10/31/2018
Ended: 10/31/2018

Drilling Co.: ETTL
Drill Rig Model: Diedrich B-50
Driller: Pedro Gonzales
Drlling Method: Hollow-Stem Auger
Hole Diameter: 8 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: ft bgs on 31-Oct-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
		0						CL	**SILTY CLAY WITH SAND**; red (10R 4/6); dry; soft to firm; trace fine grained sand; mostly fines with low plasticity.		
		0			5						
		0			10						
								SM	**SILTY SAND** ; light brown (7.5YR 6/4); dry to moist; loose to medium dense; mostly fine grained sand; some silty fines; heavy, mottling & iron staining.		Low Recovery
		0			15						
		0			20			SP	**POORLY GRADED SAND**; light brownish gray (2.5Y 6/2); moist to wet; dense; mostly fine grained sand; trace fines; iron staining.		
					25			CH	**FAT CLAY** ; light brown (7.5YR 6/3); dry; firm to hard; with high plasticity.		
					30				**Boring was terminated at approximately 25 feet bgs.**		

Project No.:
Location: ,

Boring/Well ID: 16RW01
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW02
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/12/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	RICH HERMAN	**NORTHING:**	6953440.13
SCIENTIST:	W. FOSS	**EASTING:**	3314139.68

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

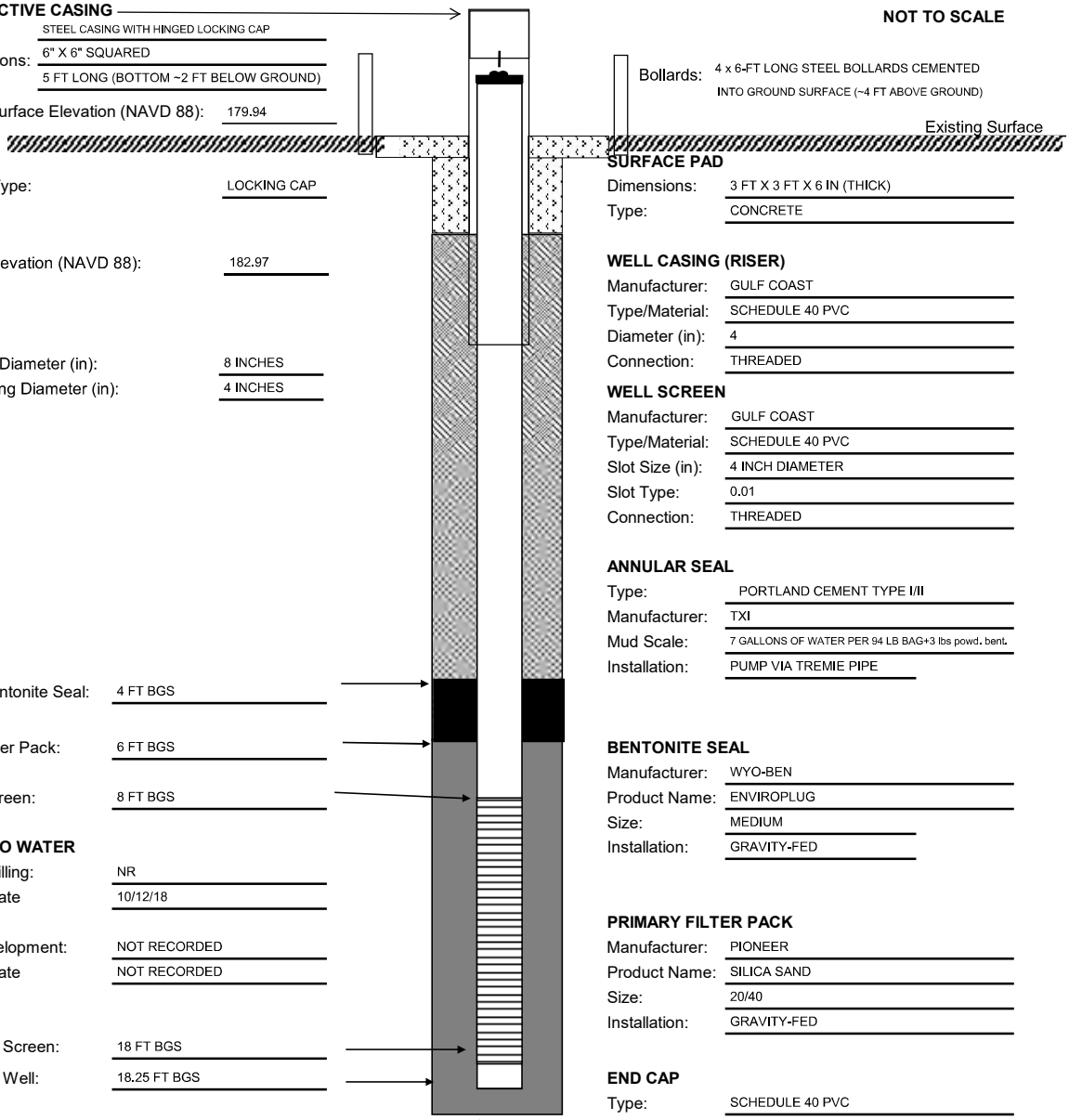
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 179.94

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 182.97

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 4 FT BGS

Top of Filter Pack: 6 FT BGS

Top of Screen: 8 FT BGS

DEPTH TO WATER

During Drilling: NR

Date: 10/12/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 18 FT BGS

Bottom of Well: 18.25 FT BGS

Borehole Depth: 18.25 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW03
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/11/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	RICH HERMAN	**NORTHING:**	6953407.93
SCIENTIST:	W. FOSS	**EASTING:**	3314167.37

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

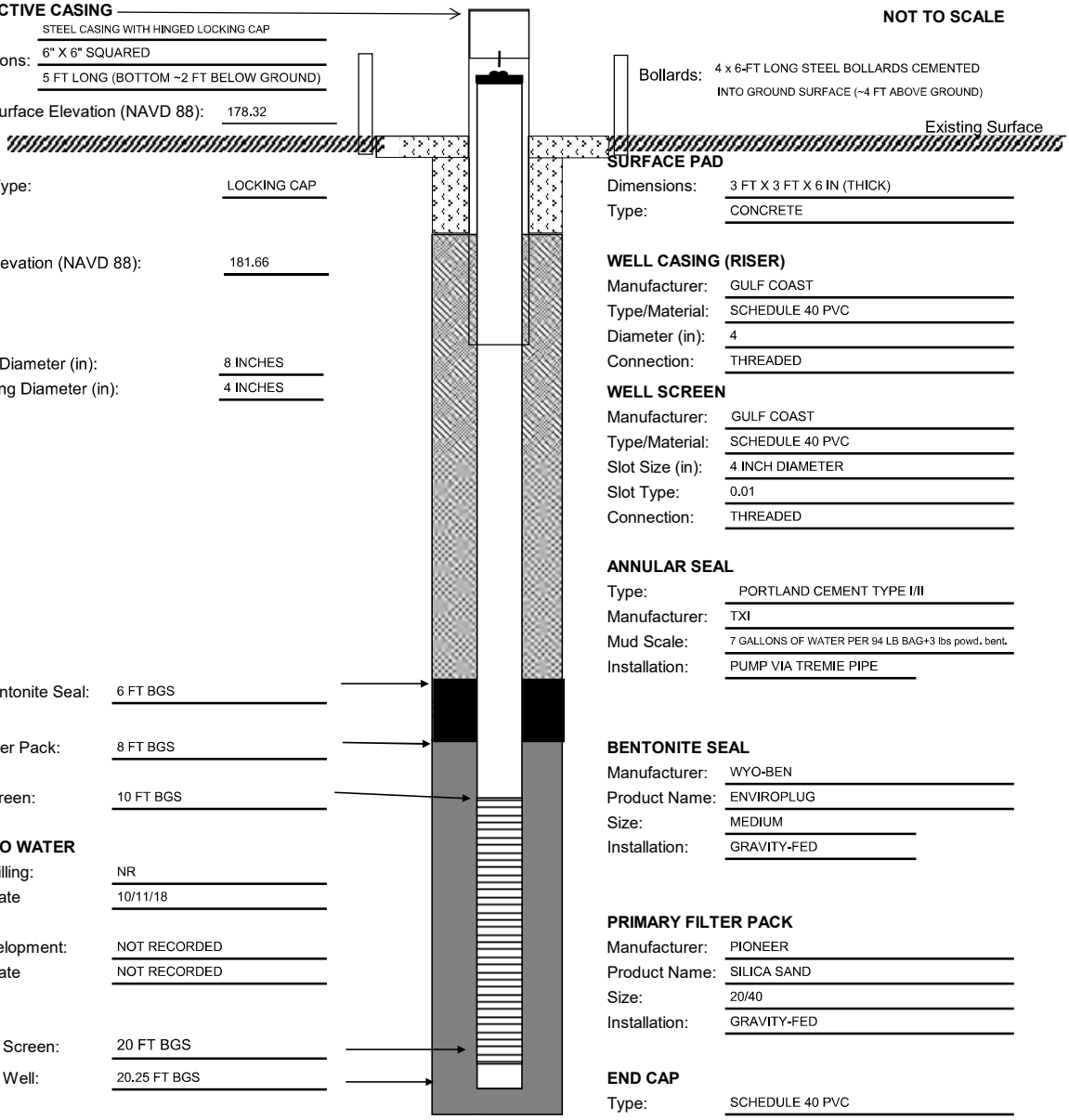
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 178.32

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 181.66

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 6 FT BGS

Top of Filter Pack: 8 FT BGS

Top of Screen: 10 FT BGS

DEPTH TO WATER

During Drilling: NR

Date: 10/11/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 20 FT BGS

Bottom of Well: 20.25 FT BGS

Borehole Depth: 20.25 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW04
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/31/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953535.89
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314226.20

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

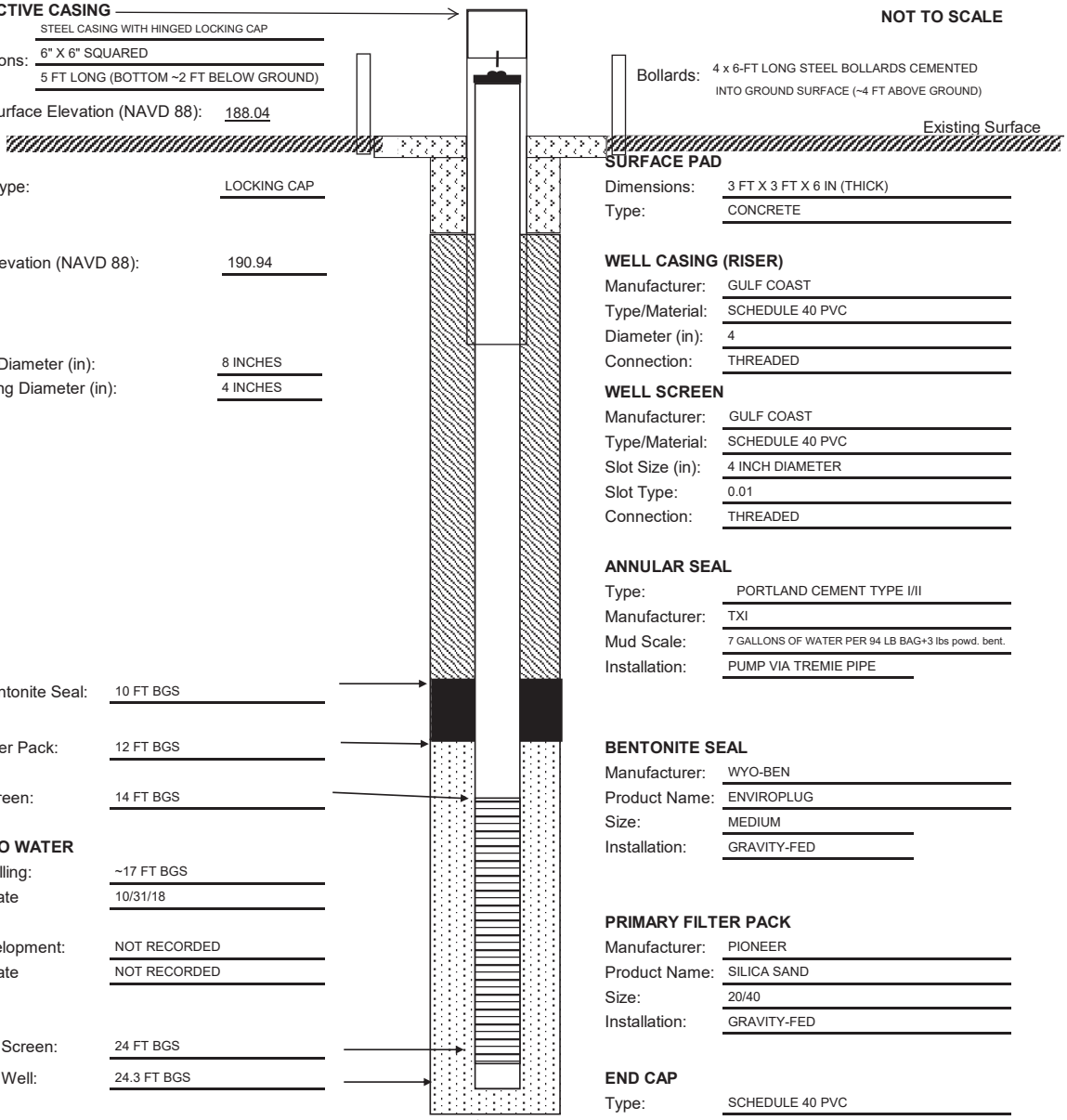
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 188.04

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 190.94

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 10 FT BGS

Top of Filter Pack: 12 FT BGS

Top of Screen: 14 FT BGS

DEPTH TO WATER

During Drilling: ~17 FT BGS

Date: 10/31/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 24 FT BGS

Bottom of Well: 24.3 FT BGS

Borehole Depth: 25

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW04
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 10/31/2018
Ended: 10/31/2018

Drilling Co.: ETTL
Drill Rig Model: Diedrich B-50
Driller: Pedro Gonzales
Drlling Method: Hollow-Stem Auger
Hole Diameter: 8 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: ft bgs on 31-Oct-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
		0						CL	**SILTY CLAY WITH SAND**; red (10R 4/6); dry; soft to firm; trace fine grained sand; mostly fines with low plasticity.		
		0			5						
		0			10						
								SM	**SILTY SAND**; light brown (7.5YR 6/4); dry to moist; loose to medium dense; mostly fine grained sand; some silty fines; heavy, mottling & iron staining.		Low Recovery
		0			15			CL	**SANDY LEAN CLAY**; light brown (7.5YR 6/3); dry; firm; trace fine grained sand; mostly fines; lighter mottling than above.		
								SP	**POORLY GRADED SAND**; light brownish gray (2.5Y 6/2); moist to wet; dense; mostly fine grained sand; trace fines; iron staining.		
		0			20						
					25			CH	**FAT CLAY**; light brown (7.5YR 6/3); dry; firm to hard; with high plasticity.		Set well at 24.5 ft bgs
					30				**Boring was terminated at approximately 25 feet bgs.**		

Project No.:
Location: ,

Boring/Well ID: 16RW04
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW05
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/11/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	RICH HERMAN	**NORTHING:**	6953395.99
SCIENTIST:	W. FOSS	**EASTING:**	3314192.31

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

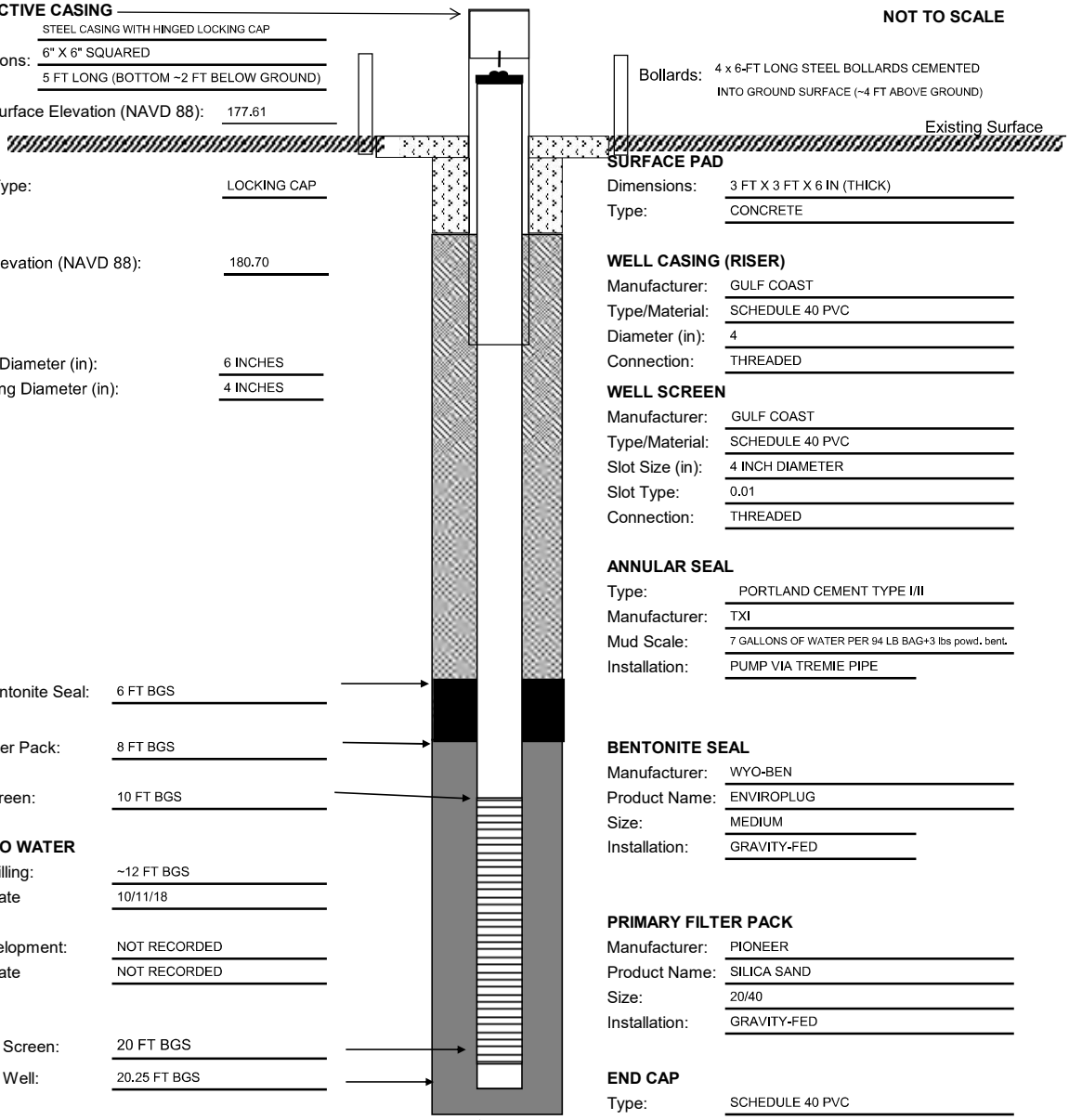
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 177.61

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 180.70

Borehole Diameter (in): 6 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 6 FT BGS

Top of Filter Pack: 8 FT BGS

Top of Screen: 10 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 10/11/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 20 FT BGS

Bottom of Well: 20.25 FT BGS

Borehole Depth: 20.25 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW06
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/23/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953828.03
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3313990.94

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

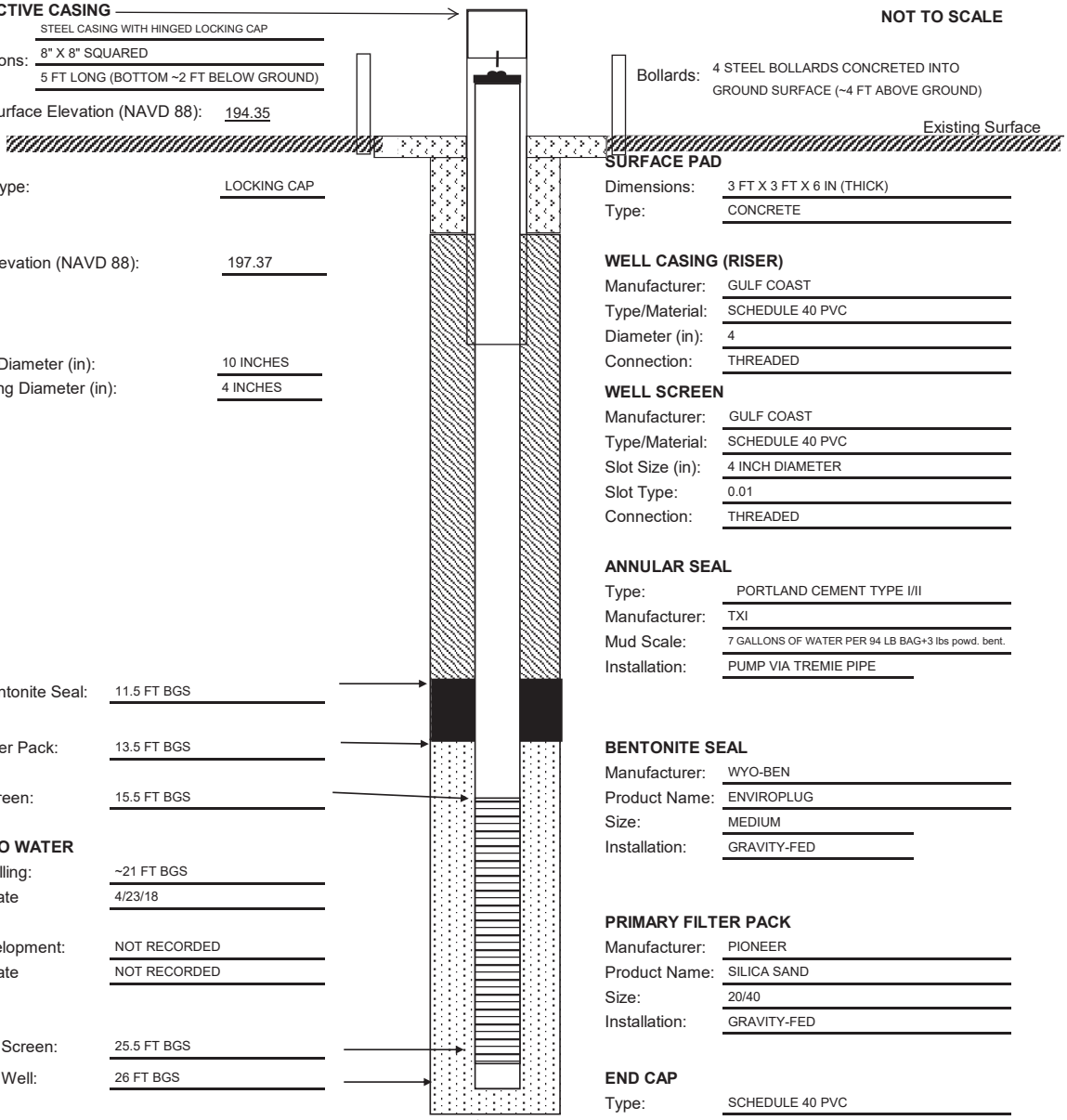
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 194.35

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 197.37

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 11.5 FT BGS

Top of Filter Pack: 13.5 FT BGS

Top of Screen: 15.5 FT BGS

DEPTH TO WATER

During Drilling: ~21 FT BGS

Date: 4/23/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 25.5 FT BGS

Bottom of Well: 26 FT BGS

Borehole Depth: 27.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW06
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/23/2018
Ended: 4/23/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 21 ft bgs on 23-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
0833		0						ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		
0841		0									
					5						
0844		0									
								ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
0848		0						CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		
								ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
					10			CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		
0853		0									
0901		0.1						ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
								CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
					15			ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
0906		0.2						CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
0913		0.1									
					20						
0919		0.1									
								SM	**SILTY SAND**; light brown (7.5YR 6/4); moist to wet; loose; some fines.		Used Pioneer silica sand 20/40
0928		0.1									
					25			CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard.		
0934		0									
									Boring was terminated at approximately 27.5 feet bgs.		Set well at 25.5; Screened from 15.5 to 25.5 ft bgs
					30						

Project No.:
Location: ,

Boring/Well ID: 16RW06
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW07
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/20/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953785.38
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3313988.18

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

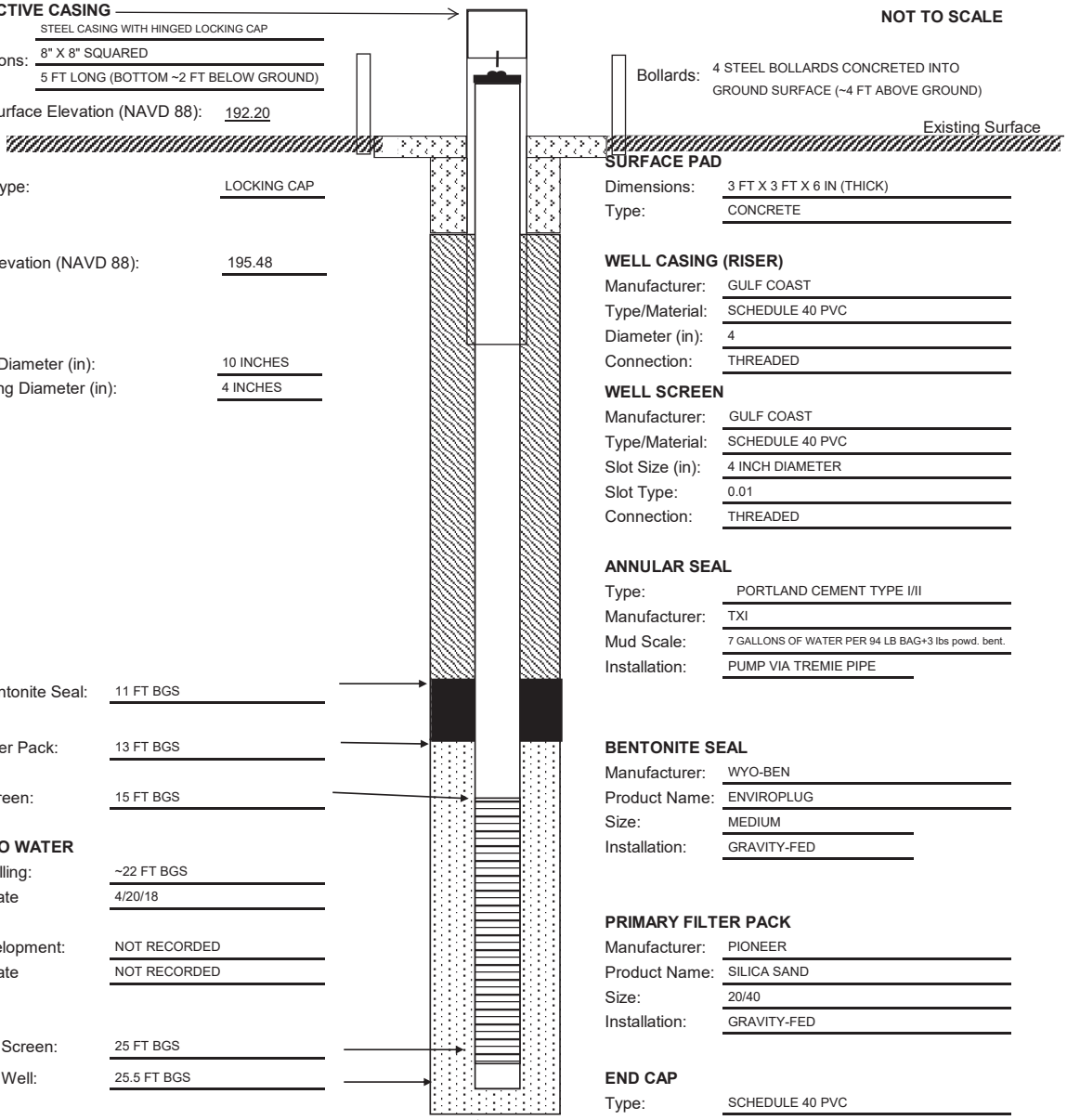
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 192.20

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 195.48

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 11 FT BGS

Top of Filter Pack: 13 FT BGS

Top of Screen: 15 FT BGS

DEPTH TO WATER

During Drilling: ~22 FT BGS

Date: 4/20/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 25 FT BGS

Bottom of Well: 25.5 FT BGS

Borehole Depth: 25.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW07
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/20/2018
Ended: 4/20/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 22 ft bgs on 20-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
0833		0							ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
									CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		
0839		0										
						5						
0842		0										
									ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
0848		0.3										
						10						
0851		0.4							CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
									ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
0900		0.2										
						15			CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		
0906		0.4										
0911		0.2							ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry to moist; soft; alternates silty sand to sandy clay.		
						20						
0917		0.2										
									SM	**SILTY SAND**; light brown (7.5YR 6/4); moist to wet; loose; some fines.		Used Pioneer silica sand 20/40
0921		0										
									CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
						25						
0922		0								**Boring was terminated at approximately 25.5 feet bgs.**		Set well at 25.5; Screened from 15 to 25 ft bgs
						30						

Project No.:
Location: ,

Boring/Well ID: 16RW07
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW08
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/19/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953788.82
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314017.82

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

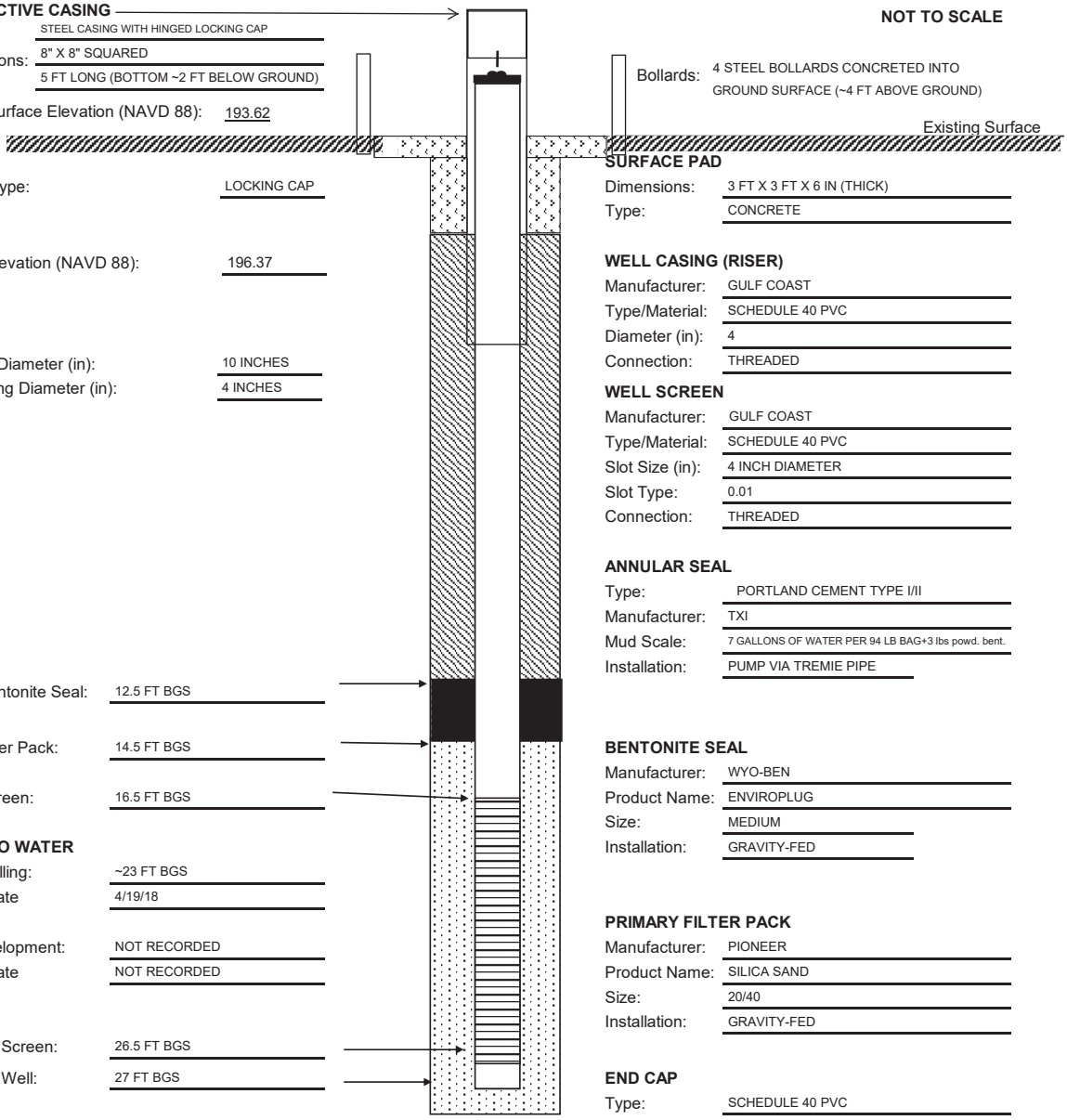
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 193.62

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 196.37

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 12.5 FT BGS

Top of Filter Pack: 14.5 FT BGS

Top of Screen: 16.5 FT BGS

DEPTH TO WATER

During Drilling: ~23 FT BGS

Date: 4/19/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 26.5 FT BGS

Bottom of Well: 27 FT BGS

Borehole Depth: 27.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW08
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/19/2018
Ended: 4/19/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 23 ft bgs on 19-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
1530		0.1						ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		
1537		0.3									
					5						
1542		0									
1546		0							With no to low plasticity.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
					10			ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry to moist; soft; alternates silty sand to sandy clay.		
1552		0						CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry; soft; mostly fines with no to low plasticity.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
1600		0.4									
								ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry; soft; alternates silty sand to sandy clay.		
					15			CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
1606		0.2									
								SM	**SILTY SAND**; light brown (7.5YR 6/4); dry; loose; some fines.		
1613		0.1						CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
					20						
1617		0.1									
1622		0						SM	**SILTY SAND**; light brown (7.5YR 6/4); moist to wet; loose; some fines.		Used Pioneer silica sand 20/40
					25						
16:60		0						CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		
									Boring was terminated at approximately 27.5 feet bgs.		Set well at 27; Screened from 16.5 to 26.5 ft bgs
					30						

Project No.:
Location: ,

Boring/Well ID: 16RW08
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW09
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/19/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953821.11
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314045.50

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

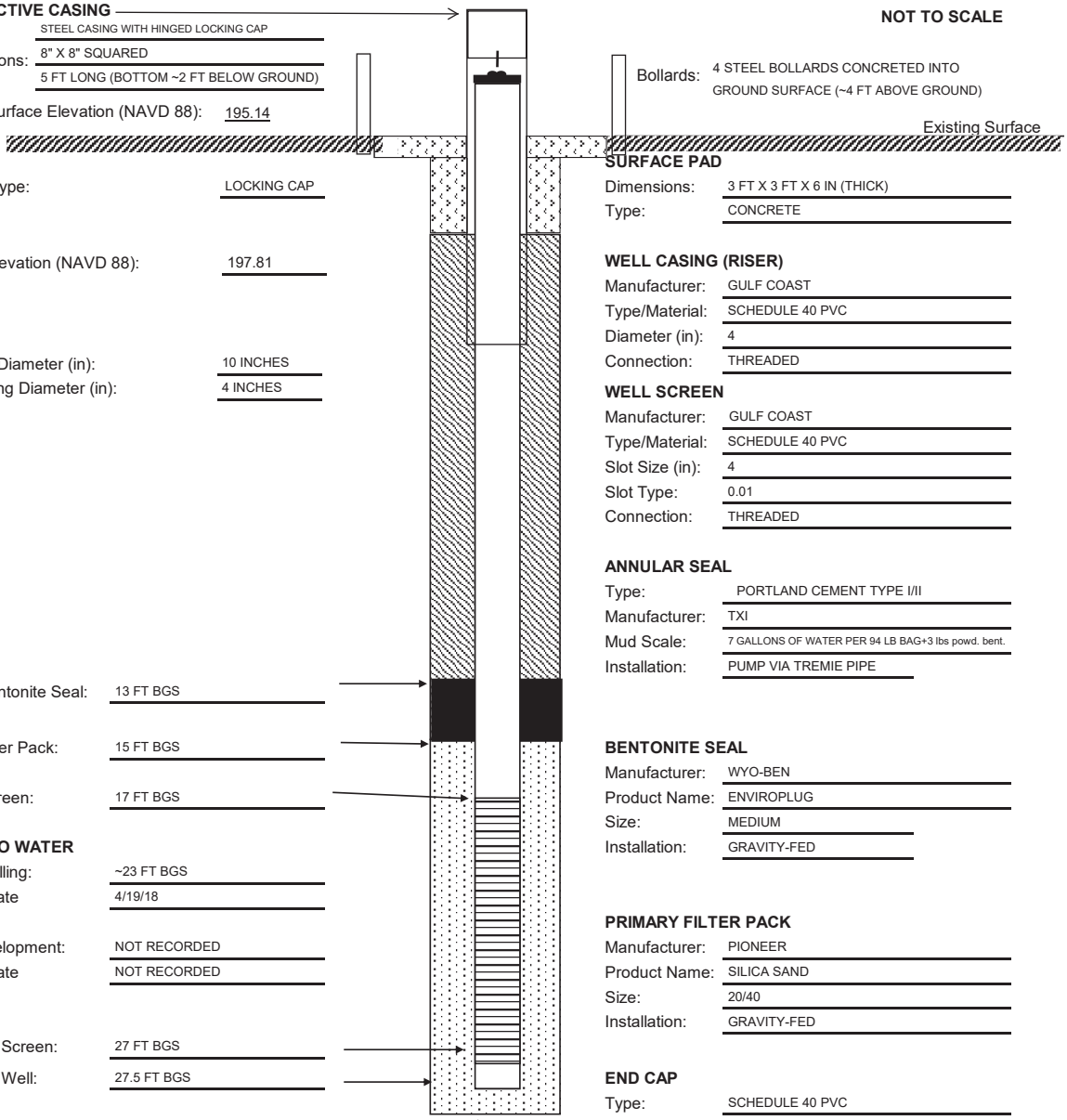
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 195.14

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 197.81

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 13 FT BGS

Top of Filter Pack: 15 FT BGS

Top of Screen: 17 FT BGS

DEPTH TO WATER

During Drilling: ~23 FT BGS

Date: 4/19/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 27 FT BGS

Bottom of Well: 27.5 FT BGS

Borehole Depth: 30

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW09
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/19/2018
Ended: 4/19/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 23 ft bgs on 19-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
0845		0						ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		
0850		0.1									
					5						Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
0855		0.2									
								ML-SM	**SANDY SILT WITH CLAY**; yellowish red (5YR 5/6); dry to moist; soft to firm; alternates silty sand to sandy clay.		
0900		0.3						CH	**SILTY FAT CLAY**; very pale brown (10YR 7/3); dry; hard to very hard; trace fine grained sand; mostly fines with high plasticity; iron staining; reddish brown.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
					10						
0910		0									
0915		0									
					15						
0920		0.1									
								SM	**SILTY SAND WITH CLAY**; yellowish red (5YR 5/6); moist; dense; some fines; mottling is 7.5YR 7/8 Red.		
0925		0.3									
								CL	**SILTY CLAY**; light brown (7.5YR 6/4); dry; soft; with high plasticity.		Used Pioneer silica sand 20/40
					20			CH	Light brown (7.5YR 6/4); increases in plasticity.		
0930		0									
0935		0						SM	**SILTY SAND**; light brown (7.5YR 6/4); wet; loose; some fines.		
					25						
1000		0									
								CH	**SILTY CLAY**; light brown (7.5YR 6/4); dry to moist; firm; mostly fines with high plasticity; little recovery, contact with upper unit is difficult to identify.		bottom of screen at 27 ft bgs
1005											
					30						

Project No.:
Location: ,

Boring was terminated at approximately 30 feet bgs.

Boring/Well ID: 16RW09
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW10
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/19/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953763.40
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314053.06

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

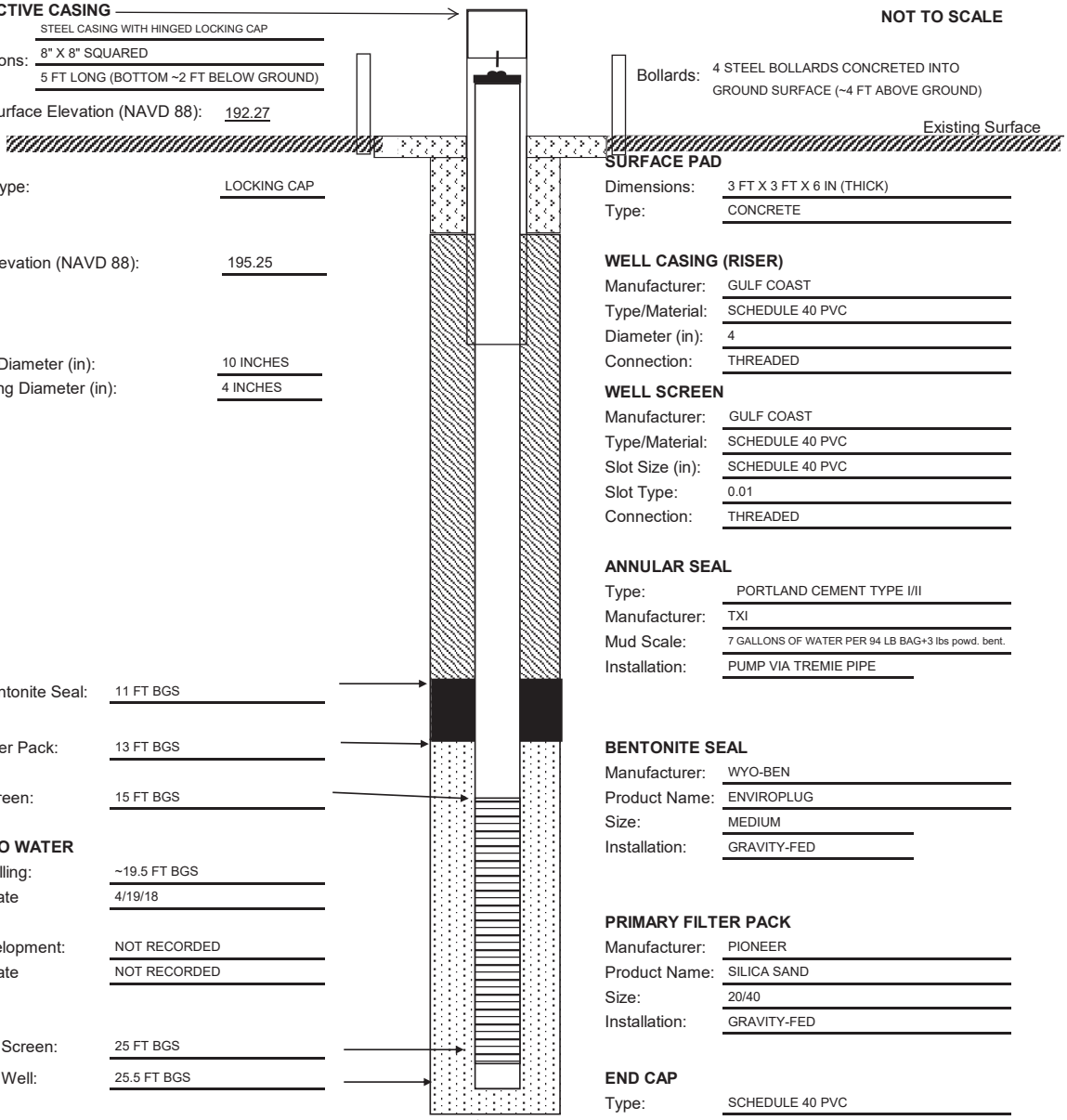
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 192.27

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 195.25

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 11 FT BGS

Top of Filter Pack: 13 FT BGS

Top of Screen: 15 FT BGS

DEPTH TO WATER

During Drilling: ~19.5 FT BGS

Date: 4/19/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 25 FT BGS

Bottom of Well: 25.5 FT BGS

Borehole Depth: 25.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): SCHEDULE 40 PVC

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW10
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 4/19/2018
Ended: 4/19/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 19.5 ft bgs on 19-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
1250		0.1						ML	**SANDY SILT**; light brown (7.5YR 6/4); dry; soft.		
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/3); dry; hard; mostly fines with medium plasticity; mottling is 7.5YR 7/8 Red.		
1255		0.4									
					5						
1300		0.1									Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
1305		0.3									
					10						
1310		0.2									
								CL	**SILTY CLAY WITH SAND**; light brown (7.5YR 6/4); dry to moist; soft; mostly fines with no to low plasticity.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
1315		0.3									
					15						
1320		0.1									
1325		0.3									
					20			SM	**SILTY SAND**; light brown (7.5YR 6/4); moist to wet; loose; some fines.		
1330		0.1									
								CH	**SILTY FAT CLAY**; light brown (7.5YR 6/4); dry; firm to hard; increases in plasticity.		Used Pioneer silica sand 20/40
1335		0.2									
					25				**Boring was terminated at approximately 25.5 feet bgs.**		Set well at 25.5; Screened from 15 to 25 ft bgs
					30						

Project No.:
Location: ,

Boring/Well ID: 16RW10
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW11
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/3/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953828.09
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314545.02

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

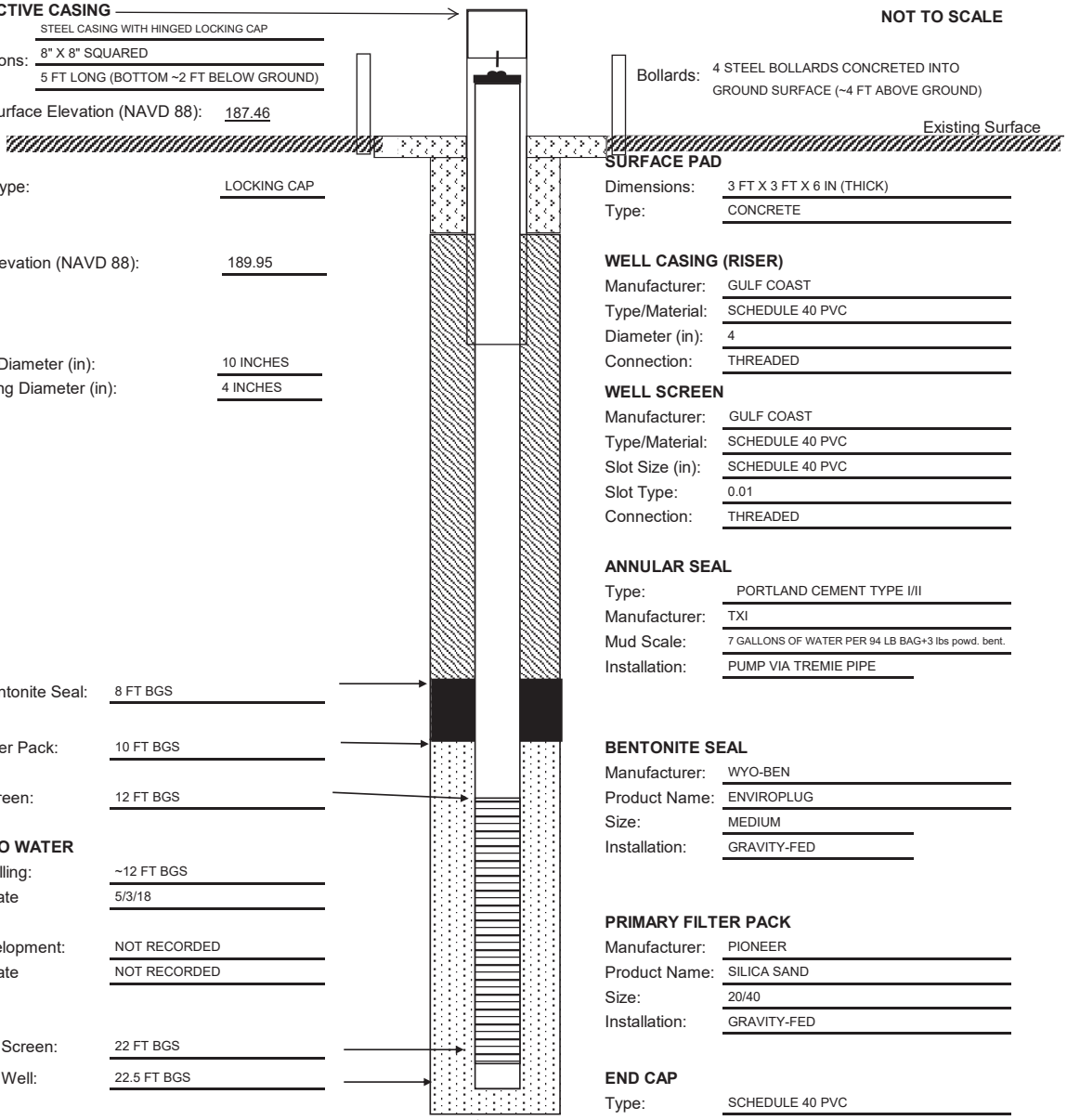
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 187.46

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 189.95

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 8 FT BGS

Top of Filter Pack: 10 FT BGS

Top of Screen: 12 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 5/3/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 22 FT BGS

Bottom of Well: 22.5 FT BGS

Borehole Depth: 25

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): SCHEDULE 40 PVC

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW11
Sheet: 1 **of** 1

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 5/3/2018
Ended: 5/3/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 12 ft bgs on 03-May-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
		0.1						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
		0.3									
		0.2			5						Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
		0.5									
		0.1			10			ML-SM	**SILTY SAND WITH CLAY**; reddish yellow (7.5YR 6/8); dry; medium dense; iron staining; browish red.		
		0.1						SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.		
		0.1			15						
		0.3						CL-ML	**CLAYEY SILT WITH SAND**; very pale brown (10YR 7/4); moist; soft; more clay content than above.		Used Pioneer silica sand 20/40
		0.1		NR	20			CL-ML	**SILTY FAT CLAY WITH SAND**; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; organic content.		No recovery from 20-22.5 ft bgs
					25				**Boring was terminated at approximately 25 feet bgs.**		Set well at 22.5 ft bgs; set screen 12' bgs to 22' bgs
					30						

Project No.:
Location: ,

Boring/Well ID: 16RW11
Sheet: 1 **of** 1

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16RW12
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/4/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953887.58
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314501.01

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

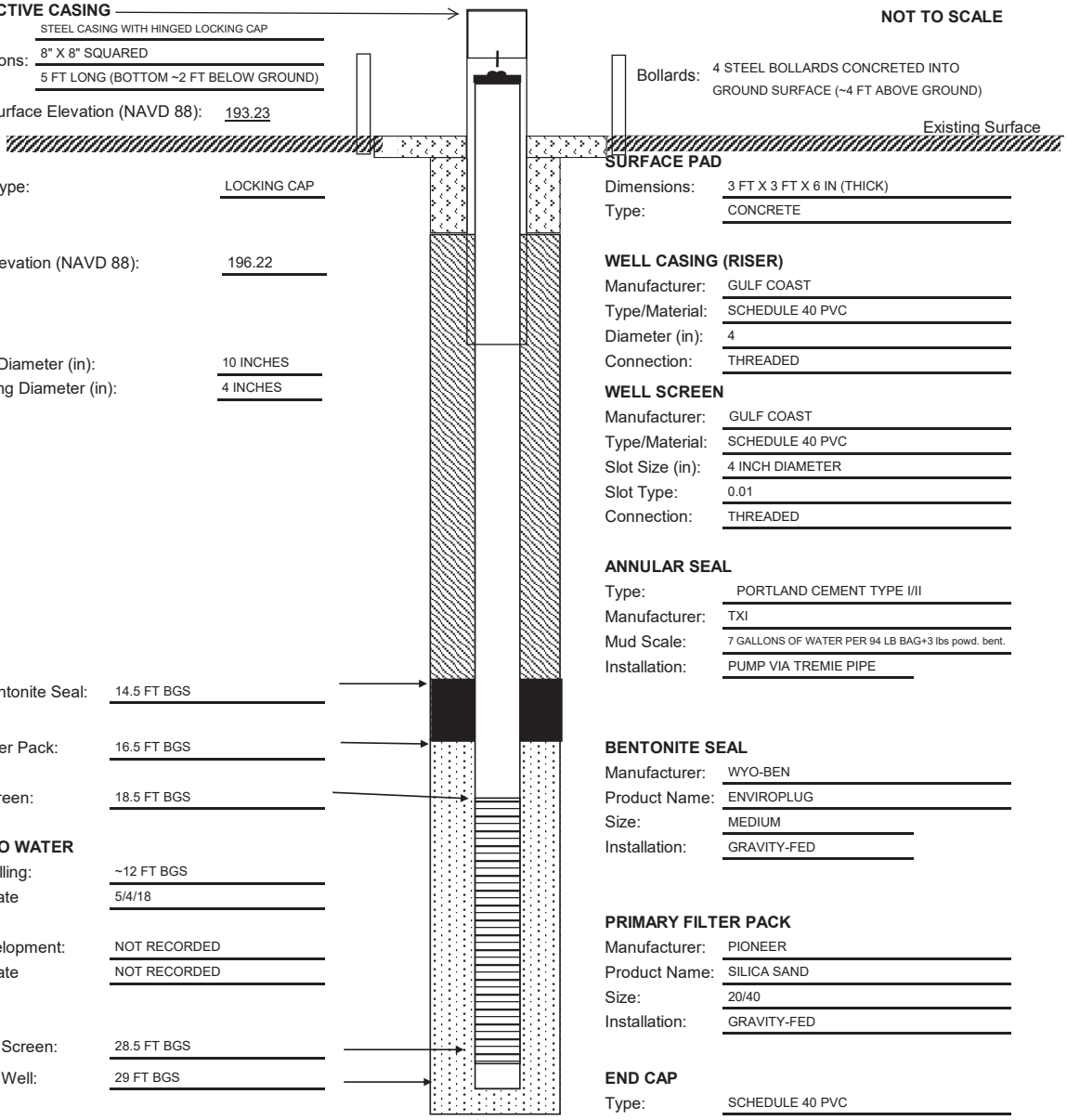
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 193.23

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 196.22

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 14.5 FT BGS

Top of Filter Pack: 16.5 FT BGS

Top of Screen: 18.5 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 5/4/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 28.5 FT BGS

Bottom of Well: 29 FT BGS

Borehole Depth: 30

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

APTIM

BORING LOG

Boring/Well ID: 16RW12
Sheet: 1 **of** 2

Project No.: 501032
Client: US ARMY
Location: LHAAP-16
Started: 5/4/2018
Ended: 5/4/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 10 **(inches)**

Logged By: Allen Willmore
Edited By: Allen Willmore
Checked By: Greg Jones
Number:

First Water: 12 ft bgs on 04-May-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
		0.1						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
		0.0									
		0.0			5						
		0.3						ML-SM	**SILTY SAND WITH CLAY**; reddish yellow (7.5YR 6/8); moist; medium dense; iron staining; browish red.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
		0.0			10						
		0.0						CH	**SILTY FAT CLAY**; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts. Allowed to hydrate for 1 hour
		0.1			15						
		0.2						SM	**SILTY SAND WITH CLAY**; very pale brown (10YR 7/4); moist to wet; loose to medium dense; alternates silty sand to sandy clay; brownish red.		
		0		NR	20						No recovery from 20-22.5
		0.1									
		0.3			25				More clay content.		
					30			CL-ML	**SILTY FAT CLAY WITH SAND**; light brown (7.5YR 6/4); dry; hard; mostly fines with high plasticity; organic content.		Used Pioneer silica sand 20/40

Project No.:
Location: ,

Boring was terminated at approximately 30 feet bgs.

Boring/Well ID: 16RW12
Sheet: 1 **of** 2

APTIM

BORING LOG

Boring/Well ID: 16RW12
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
												Set well at 29' bgs, screen from 18.5-28.5
						35						
						40						
						45						
						50						
						55						
						60						

Project No.:
Location: ,

Boring/Well ID: 16RW12
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW48
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	10/11/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	RICH HERMAN	**NORTHING:**	6953695.43
SCIENTIST:	W. FOSS	**EASTING:**	3314485.33

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

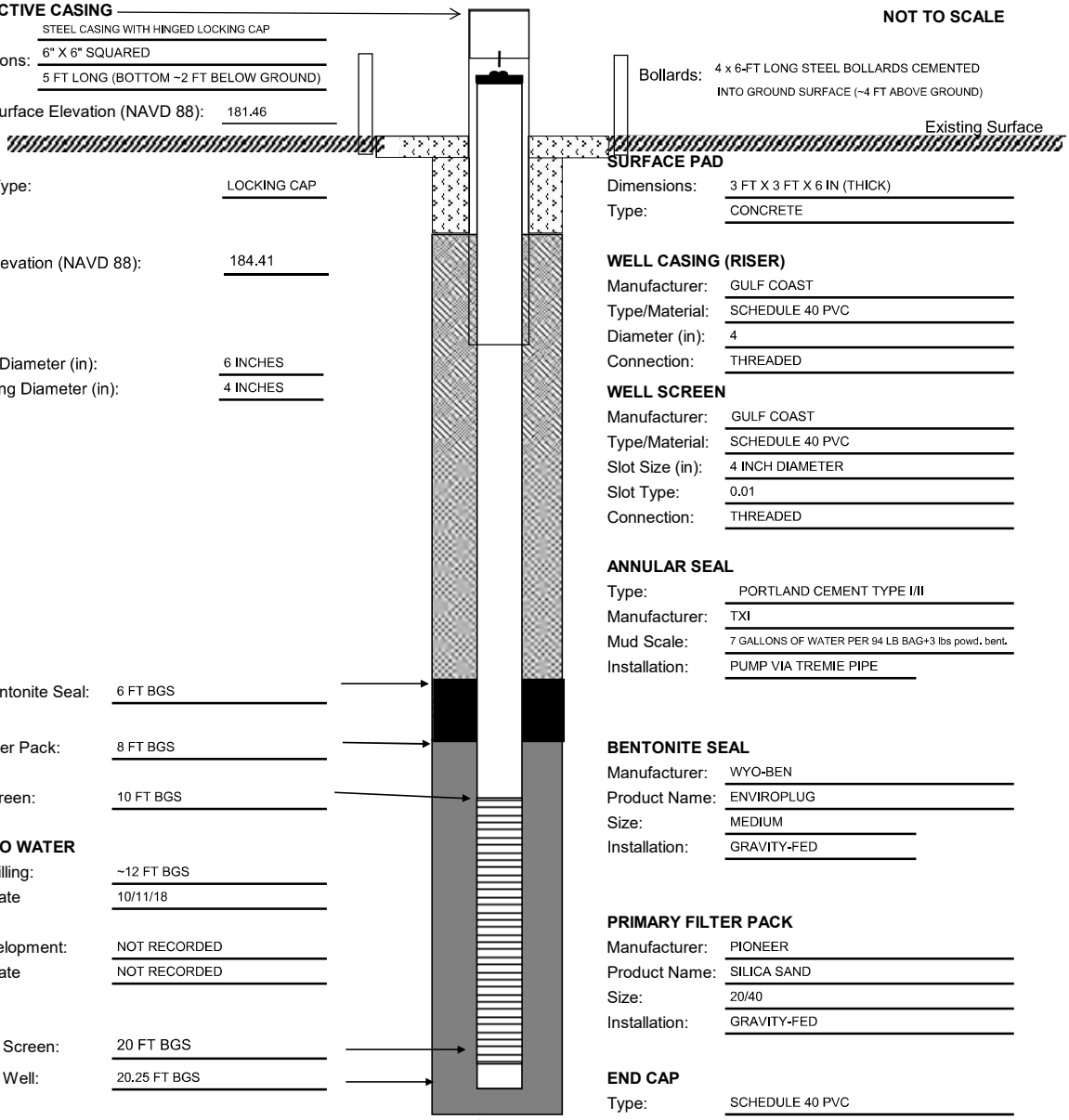
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 181.46

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 184.41

Borehole Diameter (in): 6 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 6 FT BGS

Top of Filter Pack: 8 FT BGS

Top of Screen: 10 FT BGS

DEPTH TO WATER

During Drilling: ~12 FT BGS

Date: 10/11/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 20 FT BGS

Bottom of Well: 20.25 FT BGS

Borehole Depth: 20.25 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW49
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	8/2/19
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	RICH HERMAN	**NORTHING:**	6953750.74
SCIENTIST:	W. FOSS	**EASTING:**	3314402.85

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

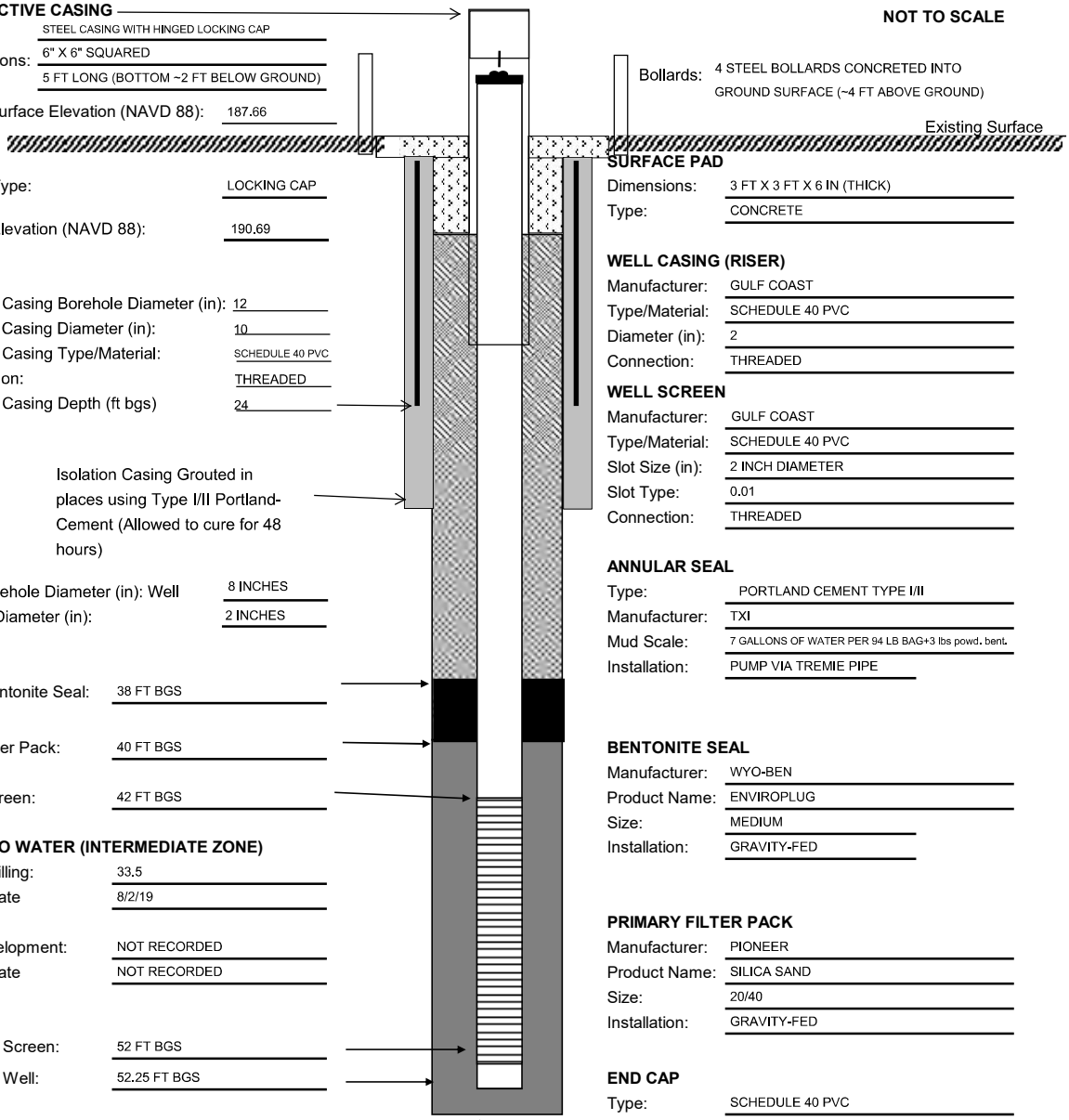
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 187.66

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 190.69

Isolation Casing Borehole Diameter (in): 12

Isolation Casing Diameter (in): 10

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 24

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 8 INCHES

Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 38 FT BGS

Top of Filter Pack: 40 FT BGS

Top of Screen: 42 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: 33.5

Date 8/2/19

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 52 FT BGS

Bottom of Well: 52.25 FT BGS

Borehole Depth: 54 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDRICAL CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

Drilling Log

Monitoring Well **16WW49**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*
Location *LHAAP-16* Proj. No. *501032*
Surface Elev. *187.66* Total Hole Depth *54.0 ft.* North *6953750.74* East *3314402.85*
Top of Casing *190.69* Water Level Initial *~33.5' bgs* Static *NA* Diameter *8 in.*
Screen: Dia *4 in.* Length *10 ft.* Type/Size *SCH. 40 PVC/0.010 in.*
Casing: Dia *4 in.* Length *42 ft.* Type *SCH. 40 PVC*
Drill Co. *ETTL* Rig/Core *Dietrich B-50 Tracked Rig*
Driller *Rich Herman* Method *Hollow-Stem Auger*
Log By *W. Foss* Date *8/2/19* Driller # *59385*

COMMENTS
Probe to 60". Log from cuttings to 60".

12" PVC Surface casing set at 24' bgs. 4" Dia well set at 52' with 10' Sch. 40 0.010" slot screen.

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0				CL	**SILTY CLAY** TOPSOIL; reddish brown, firm, moist, trace sand, some roots.
2				CL	**SILTY CLAY**; light reddish brown, stiff to hard, damp.
4					
6				ML	**SANDY SILT**; light reddish brown with light gray lenses, medium dense, damp, trace clay increasing with depth.
8				CL	**SANDY CLAY**; reddish brown with gray lenses, stiff to hard, trace silt, trace iron manganese oxide (FEMnO) staining.
10				ML	**SANDY SILT**; light gray with red lenses, medium dense, moist, trace clay.
12					
14				SW	**SILTY SAND**; orangeish brown, loose to medium dense, moist to saturated @ 14', fine grain.
16					
18				ML	**SANDY SILT**; light brown, loose, saturated, fine grain, trace clay
20					
22				CL	**SILTY CLAY**; orangeish brown with gray lenses, stiff, moist, some FeMnO staining, gray decreasing with depth.
24					

Continued Next Page

Drilling Log

Monitoring Well **16WW49**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*

Location *LHAAP-16* Proj. No. *501032*

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
					Continued
26	NR	100%		SC	Slough from material in place when casing was set. Sampler filled with **CLAYEY SAND**; light yellowish brown (10YR 6/4), loose, saturated, trace silt.
28		100%		CL	**SILTY CLAY**; yellowish brown (10YR 5/4), stiff, moist, some orangeish mottling, trace sand, sand content increasing with depth.
30		75%			
32		100%			
34		100%		SC	**CLAYEY SAND**; light yellowish brown (10YR 6/4), loose, saturated, some silt.
36		100%			
38		100%		SM	**SILTY SAND**; gray (10YR 6/1), loose to medium dense, saturated, trace clay
40		100%			
42		85%			Grain size increases from fine to medium @ 41',then back to fine at 41.5'.
44		100%			Color change to light brownish gray (10YR 6/2) @ 44.5'.
46		100%			Medium grained 42-45', increasing clay at 45-46'.
48		100%			
50		85%		CL	**SILTY CLAY**; dark gray (10YR 4/1), hard, damp, trace light gray mottles interbedded with **CLAYEY SILT**; light gray (10YR 7/1), with hard, damp, small sand lenses (<1" thick).
52		100%			
54					**END OF BORING AT 54 FEET.**
56					
58					

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW51
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	5/3/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953616.52
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314455.29

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

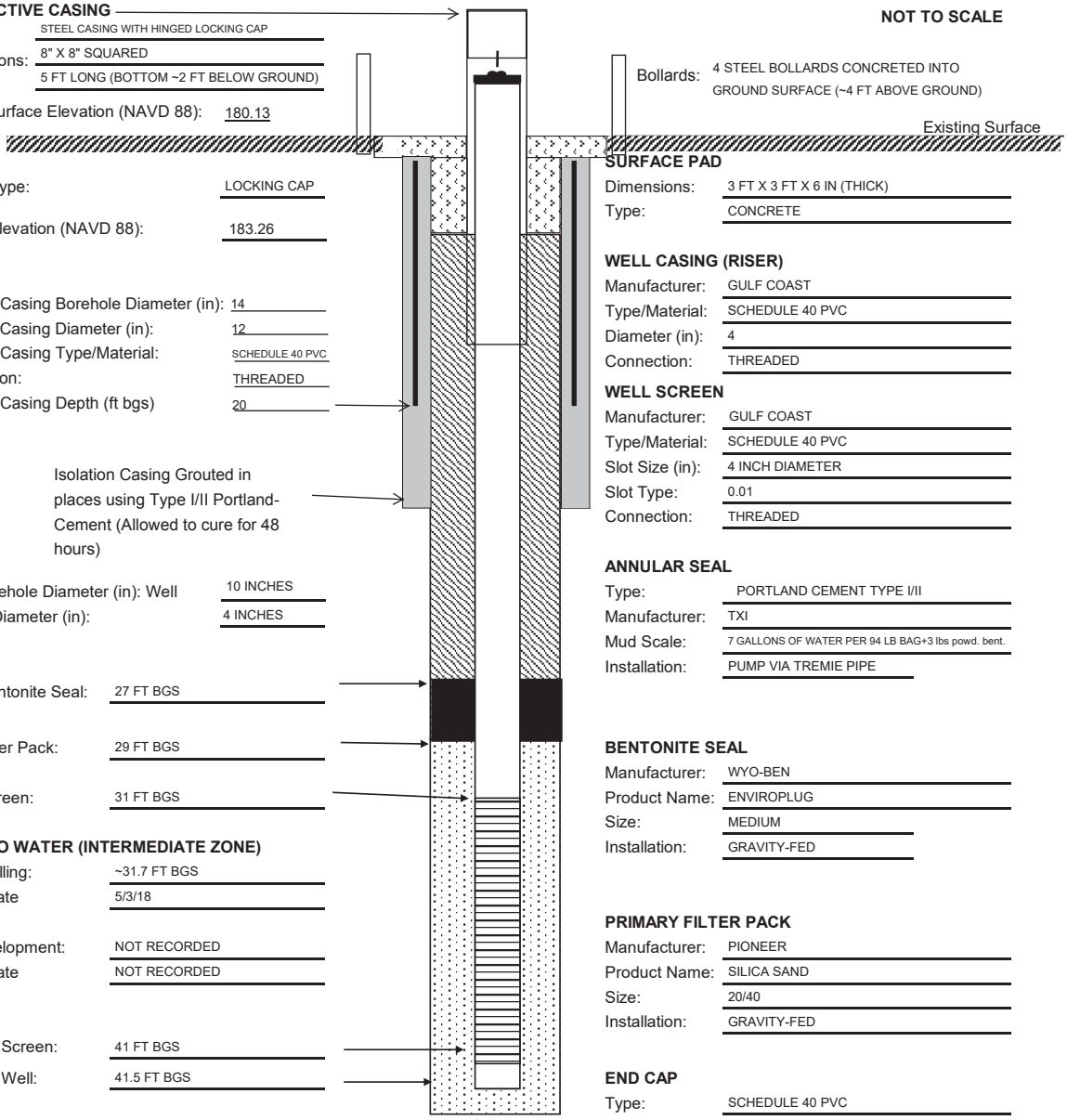
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 180.13

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 183.26

Isolation Casing Borehole Diameter (in): 14

Isolation Casing Diameter (in): 12

Isolation Casing Type/Material: SCHEDULE 40 PVC

Connection: THREADED

Isolation Casing Depth (ft bgs) 20

Isolation Casing Grouted in places using Type I/II Portland-Cement (Allowed to cure for 48 hours)

Well Borehole Diameter (in): Well 10 INCHES

Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 27 FT BGS

Top of Filter Pack: 29 FT BGS

Top of Screen: 31 FT BGS

DEPTH TO WATER (INTERMEDIATE ZONE)

During Drilling: ~31.7 FT BGS

Date 5/3/18

Post Development: NOT RECORDED

Date NOT RECORDED

Bottom of Screen: 41 FT BGS

Bottom of Well: 41.5 FT BGS

Borehole Depth: 42.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

BORING LOG

Boring/Well ID: 16WW51
Sheet: 1 of 2

Project No.: 501032
Client: USACE
Location: LONGHORN AAP, SITE 16
Started: 4/30/2018
Ended: 5/3/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drilling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By:
Checked By: G.N.Jones
Number:

First Water: ft bgs on at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		0						CH	**SILTY FAT CLAY** ; dry; hard; mostly fines with high plasticity; iron staining, reddish-brown.	Probed 5 holes for utility clearance. Pattern greater than diameter of auger
		0								
		0			5					
		0								
		0			10			SM	**SILTY SAND WITH CLAY** ; moist to wet; soft to firm; alternates silty sand to sandy clay; brownish red.	Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
		0						CL	**SILTY CLAY** ; dry; firm; with high plasticity.	
		0			15					
		0.2								
		0			20					Set 12" Isolation Casing at 20 ft bgs
		0.3								
		0			25					
		0								
		0.2			30					

CB&I MEDIUM LOG LONGHORN.GPJ SHAWEI.GDT 5/15/18

BORING LOG

Boring/Well ID: 16WW51
Sheet: 2 **of** 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	COMMENTS OR NOTES
		0									
		0							SP-SM	**SILTY SAND** ; greenish gray (5BG 5/1); wet; dense; mostly subangular to subrounded, fine grained sand; -Becomes Wet.	
						35			SP	**POORLY GRADED SAND** ; wet; loose to medium dense; fine to medium grained sand; few silty fines.	
		0.2								Bluish black (10B 2.5/1); -more organic.	
						40			CH	**FAT CLAY** ; greenish gray (5BG 5/1); dry; firm to hard; trace sand; mostly fines with high plasticity.	set bottom of well at 41.5' bgs. Screen from 31 to 41
										Boring was terminated at approximately 42.5 feet bgs.	
						45					
						50					
						55					
						60					

Project No.:
Location: ,

Boring/Well ID: 16WW51
Sheet: 2 **of** 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW55
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	4/18/18
DRILLING CONTRACTOR:	BEST DRILLING	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	SONNY TOBOLA	**NORTHING:**	6953802.81
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314115.62

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

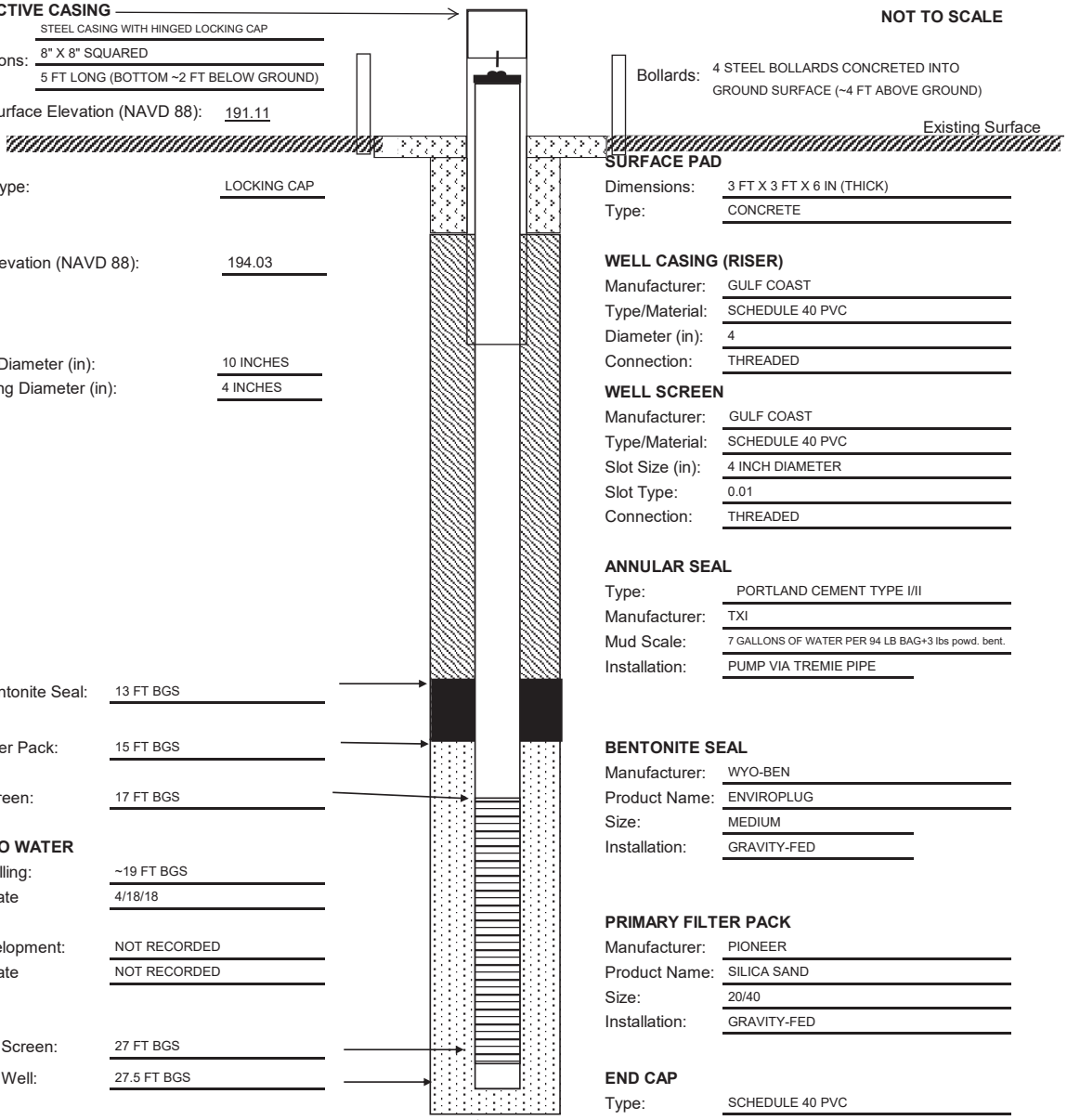
Dimensions: 8" X 8" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 191.11

Bollards: 4 STEEL BOLLARDS CONCRETED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 194.03

Borehole Diameter (in): 10 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 13 FT BGS

Top of Filter Pack: 15 FT BGS

Top of Screen: 17 FT BGS

DEPTH TO WATER

During Drilling: ~19 FT BGS

Date: 4/18/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 27 FT BGS

Bottom of Well: 27.5 FT BGS

Borehole Depth: 27.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 6 INCH CONE

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

BORING LOG

Boring/Well ID: 16WW55
Sheet: 1 **of** 1

Project No.: 501032
Client: USACE
Location: LONGHORN AAP, SITE 16
Started: 4/18/2018
Ended: 4/18/2018

Drilling Co.: Best Drilling Services, Inc.
Drill Rig Model: CME-75
Driller: Sonny Tabola
Drlling Method: Hollow-Stem Auger
Hole Diameter: 12 **(inches)**

Logged By: Allen Willmore
Edited By:
Checked By: G.N.Jones
Number:

First Water: 19 ft bgs on 18-Apr-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
1305		0.1							MLS CH	**SANDY ELASTIC SILT** ; moist; soft; mostly fines with no to low plasticity; iron staining, reddish-brown.		
										SILTY FAT CLAY ; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
		0.4										
						5						
		1.4										
									ML-SM	**SANDY SILT WITH CLAY** ; dry; soft to firm; alternates silty sand to sandy clay; brownish red.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag.
		0.6							CH	**SILTY FAT CLAY** ; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
						10						
		0.2										
		0.3										
						15			SM	**SILTY SAND** ; moist; dense; some fines.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts Allowed to hydrate for 1 hour
		0.1							CL	**SILTY CLAY** ; dry; firm; with high plasticity.		
		0.6										
						20			SM	**SILTY SAND** ; wet; loose; some fines.		
		0										
		0.0										
						25			CH	**SILTY CLAY** ; dry to moist; firm; mostly fines with high plasticity.		Used Pioneer silica sand 20/40
										Boring was terminated at approximately 27.5 feet bgs.		
						30						

Project No.:
Location: ,

Boring/Well ID: 16WW55
Sheet: 1 **of** 1

CB&I MEDIUM LOG LONGHORN.GPJ SHAWE.GDT 5/5/18

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW56
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	11/01/18
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953958.38
SCIENTIST:	ALLEN WILLMORE	**EASTING:**	3314545.68

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

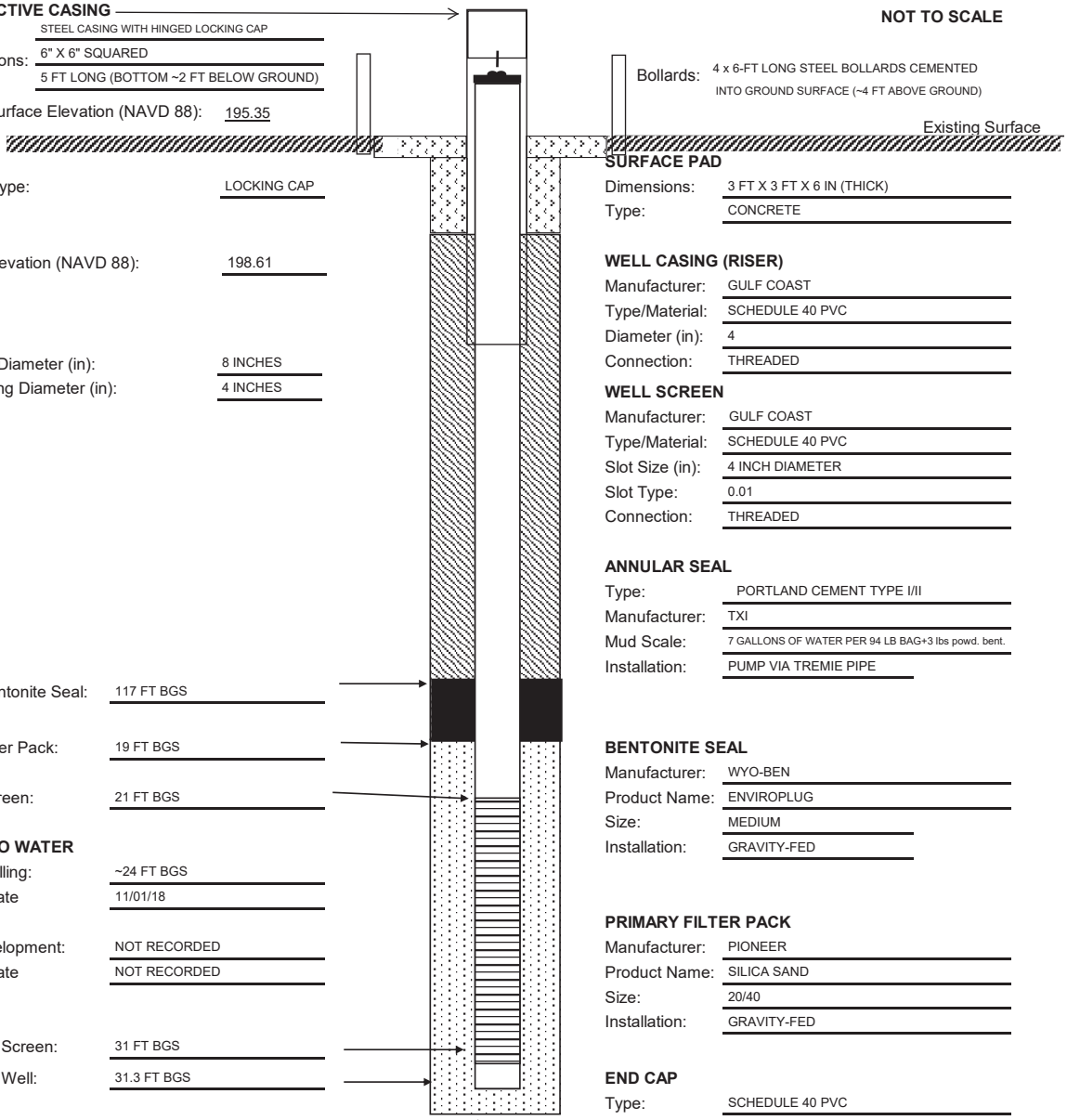
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 195.35

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 198.61

Borehole Diameter (in): 8 INCHES

Well Casing Diameter (in): 4 INCHES

Top of Bentonite Seal: 117 FT BGS

Top of Filter Pack: 19 FT BGS

Top of Screen: 21 FT BGS

DEPTH TO WATER

During Drilling: ~24 FT BGS

Date: 11/01/18

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 31 FT BGS

Bottom of Well: 31.3 FT BGS

Borehole Depth: 31.5

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 4

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 4 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

BORING LOG

Boring/Well ID: 16WW56
Sheet: 1 of 2

Project No.: 501032
Client: USACE
Location: LONGHORN AAP, SITE 16
Started: 11/1/2018
Ended: 11/1/2018

Drilling Co.: ETTL
Drill Rig Model: Diedrich B-50
Driller: Pedro Gonzales
Drlling Method: Hollow-Stem Auger
Hole Diameter: 8 (inches)

Logged By: Allen Willmore
Edited By:
Checked By: G.N.Jones
Number:

First Water: ft bgs on 01-Nov-18 at hrs
Static Water: ft bgs on at hrs

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
									CH	**SILTY FAT CLAY** ; dry; hard; mostly fines with high plasticity; iron staining; reddish brown.		
						5						
									ML-SM	**SILTY SAND WITH CLAY** ; reddish yellow (7.5YR 6/8); moist; medium dense; iron staining; browish red.		Portland-Cement grout was mixed to a ratio of 7 gallons of water per 94lb bag
									CL	**SILTY FAT CLAY** ; pale brown (10YR 6/3); dry; very hard; mostly fines with medium plasticity; iron staining, drilling is hard.		Used Enviroplug Medium Bentonite Chips. Hydrated chips in1 ft lifts Allowed to hydrate for 1 hour
						10						
						15				-becomes softer.		
									SM	**SANDY SILT** ; pale brown (10YR 6/3); dry to moist; -becomes stiff.		
						20						

CB&I SHORT LOG LONGHORN.GPJ SHAWEI.GDT 4/8/20

BORING LOG

Boring/Well ID: 16WW56
Sheet: 2 of 2

TIME	SAMPLE NUMBER	PID (ppm)	BLOWS (per 6 inch)	INTERVAL	RECOVERY	DEPTH (feet)	ELEVATION (feet msl)	GRAPHIC LOG	SOIL/ROCK SYMBOL	SOIL / ROCK DESCRIPTION	WELL DETAIL	COMMENTS OR NOTES
										Wet.		
						25						
									SP	**POORLY GRADED SAND** ; light reddish brown (5YR 6/3); wet; loose; subangular to subrounded, fine grained sand; some fines.		
						30			CL-ML	**SILTY FAT CLAY WITH SAND** ; pale brown (10YR 6/3); dry; hard; mostly fines with high plasticity; organic content.		Used Pioneer silica sand 20/40
										Boring was terminated at approximately 32 feet bgs.		
						35						
						40						

Project No.: 501032
Location: LONGHORN AAP, SITE 16

Boring/Well ID: 16WW56
Sheet: 2 of 2

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW57
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	8/5/19
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953896.70
SCIENTIST:	W. FOSS	**EASTING:**	3314654.99

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

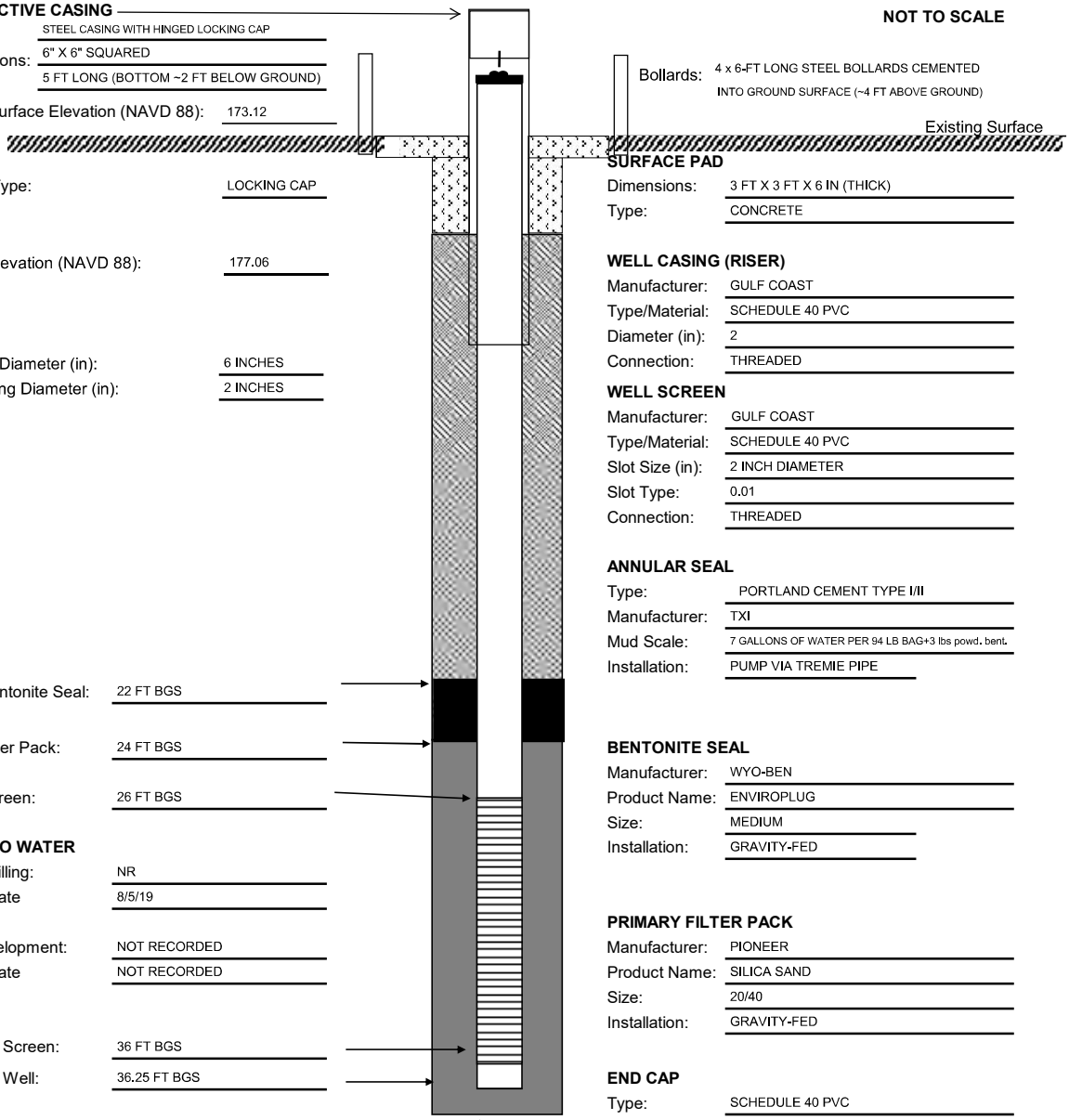
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 173.12

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 177.06

Borehole Diameter (in): 6 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 22 FT BGS

Top of Filter Pack: 24 FT BGS

Top of Screen: 26 FT BGS

DEPTH TO WATER

During Drilling: NR

Date: 8/5/19

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 36 FT BGS

Bottom of Well: 36.25 FT BGS

Borehole Depth: 38 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

Drilling Log

Monitoring Well **16WW57**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*
Location *LHAAP-16* Proj. No. *501032*
Surface Elev. *173.12* Total Hole Depth *38.0 ft.* North *6953896.70* East *3314654.99*
Top of Casing *177.06* Water Level Initial *~23' bgs* Static *NA* Diameter *7.25 in.*
Screen: Dia *2 in.* Length *10 ft.* Type/Size *SCH. 40 PVC/0.010 in.*
Casing: Dia *2 in.* Length *26 ft.* Type *SCH. 40 PVC*
Drill Co. *ETTL* Rig/Core *Dietrich B-50 Tracked Rig*
Driller *Pedro Gonzales* Method *Hollow-Stem Auger*
Log By *W. Foss* Date *8/5/19* Driller # *59385*

COMMENTS
2" Dia. well set at 36' bgs with 10' Sch. 40 PVC 0.010" slot screen

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0				CL	**SANDY CLAY** TOPSOIL
		0%		CL	**SANDY CLAY**; light brownish gray (10YR 6/2) with yellowish red (5YR 6/6) mottles, firm, damp, trace silt.
2		100%		SC	**CLAYEY SAND**; light gray (10YR 7/1) with orange oxidation, loose, saturated, some iron manganese oxide (FeMnO) nodules.
4		100%			
6		0%			**SANDY CLAY**; grayish brown (10YR 5/2), soft, wet, trace oxidation staining.
8		100%			Color change to light gray (10YR 7/1) @ 7.5'. Clayey Sand lenses @ 8.5-9.5'.
10		100%			**SILTY CLAY**; light gray (2.5Y 7/1), soft, moist, trace oxidation staining. Color change to reddish yellow (5YR 6/8) @@ 11'.
12		100%			Light gray (2.5Y 7/1) mottling from 12.5-14'.
14		100%		CL	**SANDY CLAY**; pale brown (10YR 6/2) with light gray (10YR 7/1) mottles, firm, moist, some silt.
16		100%			Stiff at 17'.
18		100%			
20		100%			
22		100%			

Continued Next Page

Drilling Log

Monitoring Well **16WW57**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*

Location *LHAAP-16* Proj. No. *501032*

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
					Continued
24		100%			**CLAYEY SAND**; yellowish brown (10YR 5/6), medium dense, saturated, trace silt. Several small (<3") lenses with heavy iron oxidation staining and nodules
26				SC	Silt and clay increasing with depth beyond 26.5'.
28					
30					**SILTY SAND**; interbedded light gray (7.5YR 7/1) and brown (7.5YR 5/4) lenses, loose to medium dense, saturated, fine to medium grain sand.
32				SM	Medium grained and color change to olive gray (5Y 5/2) at 32'. Silt content decreasing with depth.
34					
36					**SILTY CLAY**; dark gray (10YR 4/1), stiff to hard, damp.
38					**END OF BORING AT 38 FEET.**
40					
42					
44					
46					
48					
50					
52					

WELL CONSTRUCTION DIAGRAM (Above ground)

SITE:	LONGHORN ARMY AMMUNITION PLANT - SITE 16	**WELL/BORING ID:**	16WW58
PROJECT NAME:	REMEDIAL ACTION AT SITE 16	**DRILLING METHOD:**	HOLLOW STEM AUGER
PROJECT NO.:	501032	**DATE(S):**	8/7/19
DRILLING CONTRACTOR:	ETTL	**SURVEYOR:**	COLLINS SURVEYING AND MAPPING, INC.
DRILLER:	PEDRO GONZALES	**NORTHING:**	6953665.15
SCIENTIST:	W. FOSS	**EASTING:**	3314691.22

NOT TO SCALE

PROTECTIVE CASING

Type: STEEL CASING WITH HINGED LOCKING CAP

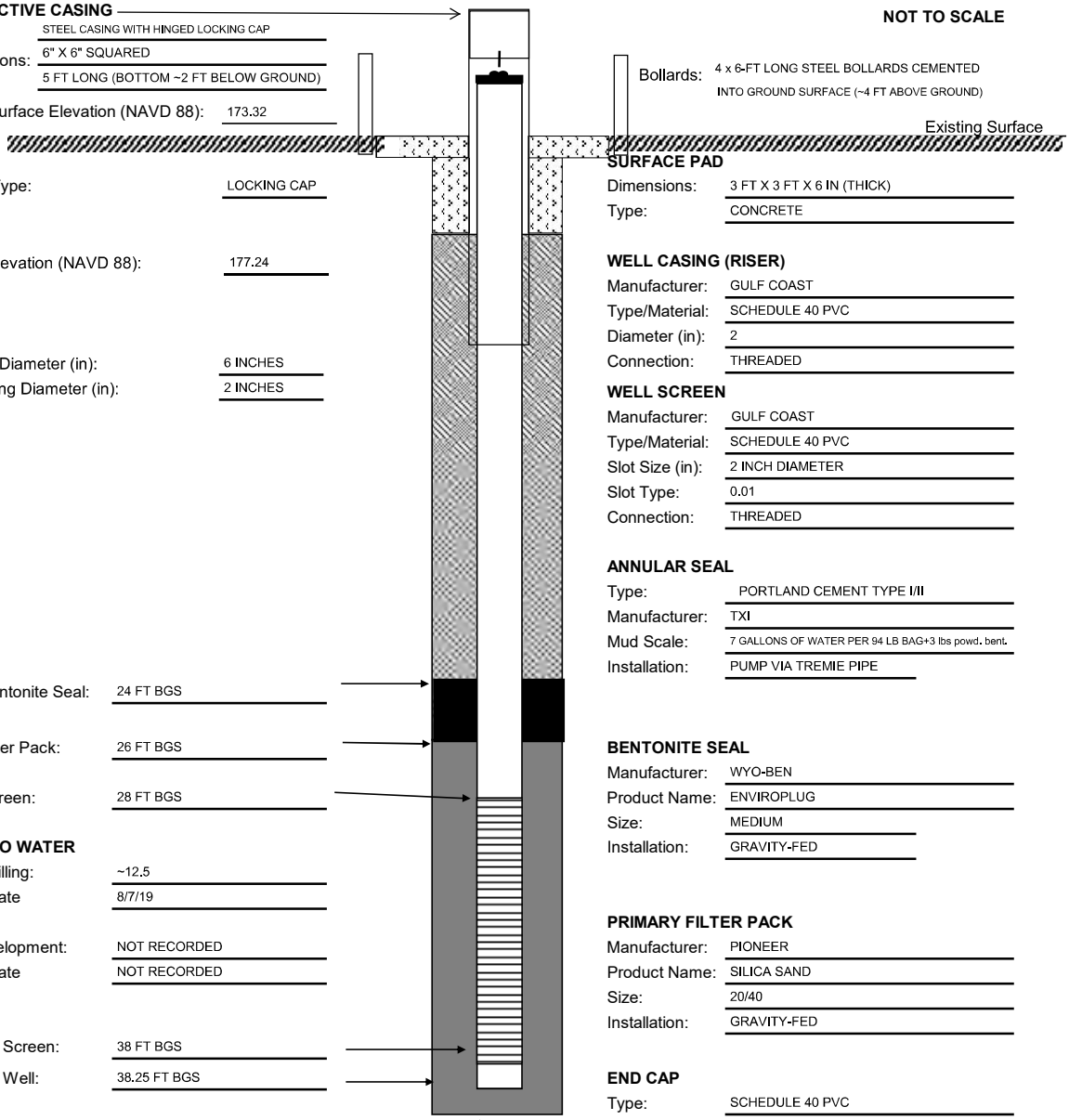
Dimensions: 6" X 6" SQUARED

Length: 5 FT LONG (BOTTOM ~2 FT BELOW GROUND)

Ground Surface Elevation (NAVD 88): 173.32

Bollards: 4 x 6-FT LONG STEEL BOLLARDS CEMENTED INTO GROUND SURFACE (~4 FT ABOVE GROUND)

Existing Surface



Well Lid Type: LOCKING CAP

Casing Elevation (NAVD 88): 177.24

Borehole Diameter (in): 6 INCHES

Well Casing Diameter (in): 2 INCHES

Top of Bentonite Seal: 24 FT BGS

Top of Filter Pack: 26 FT BGS

Top of Screen: 28 FT BGS

DEPTH TO WATER

During Drilling: ~12.5

Date: 8/7/19

Post Development: NOT RECORDED

Date: NOT RECORDED

Bottom of Screen: 38 FT BGS

Bottom of Well: 38.25 FT BGS

Borehole Depth: 40 FT BGS

SURFACE PAD

Dimensions: 3 FT X 3 FT X 6 IN (THICK)

Type: CONCRETE

WELL CASING (RISER)

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Diameter (in): 2

Connection: THREADED

WELL SCREEN

Manufacturer: GULF COAST

Type/Material: SCHEDULE 40 PVC

Slot Size (in): 2 INCH DIAMETER

Slot Type: 0.01

Connection: THREADED

ANNULAR SEAL

Type: PORTLAND CEMENT TYPE I/II

Manufacturer: TXI

Mud Scale: 7 GALLONS OF WATER PER 94 LB BAG+3 lbs powd. bent.

Installation: PUMP VIA TREMIE PIPE

BENTONITE SEAL

Manufacturer: WYO-BEN

Product Name: ENVIROPLUG

Size: MEDIUM

Installation: GRAVITY-FED

PRIMARY FILTER PACK

Manufacturer: PIONEER

Product Name: SILICA SAND

Size: 20/40

Installation: GRAVITY-FED

END CAP

Type: SCHEDULE 40 PVC

Length: 4 INCH LONG CYLINDER BLANK CELLAR

BACKFILL MATERIAL

Type: 20/40 SILICA SAND

Comments: One foot of bentonite was introduced then allowed to hydrate for 30 minutes, then a second foot of bentonite was introduced and allowed to hydrate 30 minutes prior to introducing grout.

Drilling Log

Monitoring Well **16WW58**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*
Location *LHAAP-16* Proj. No. *501032*
Surface Elev. *173.32* Total Hole Depth *40.0 ft.* North *6953665.15* East *3314691.22*
Top of Casing *177.24* Water Level Initial *~12.5' bgs* Static *NA* Diameter *7.25 in.*
Screen: Dia *2 in.* Length *10 ft.* Type/Size *SCH. 40 PVC/0.010 in.*
Casing: Dia *2 in.* Length *28 ft.* Type *SCH. 40 PVC*
Drill Co. *ETTL* Rig/Core *Dietrich B-50 Tracked Rig*
Driller *Pedro Gonzales* Method *Hollow-Stem Auger*
Log By *W. Foss* Date *8/7/19* Driller # *59385*

COMMENTS
2" Dia. well set at 38' bgs with 10' Sch. 40 PVC 0.010" slot screen

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0				CL	**SANDY CLAY** TOPSOIL with roots
		100%		CL	**SANDY CLAY**; brown (7.5YR 5/4), firm, damp, trace silt, trace oxidation, oxidation increasing with depth.
2					
		100%			
4					Color change to light brownish gray (10YR 6/2) @ 3.5', soft, moist to wet **SANDY CLAY**; mottled light brownish gray (10YR 6/2) and yellowish red (5YR 4/6), soft, moist, trace iron manganese oxide (FeMnO) oxidation, trace silt.
		100%			
6					
		50%		SC	**CLAYEY SAND**; light gray (10YR 7/1), medium dense, wet, oxidation mottles increasing with depth.
8				CL	**SANDY CLAY**; light gray (10YR 7/1) with orange mottles, soft, moist, trace silt increasing with depth.
		75%			
10					Interbedded wet sandy lenses (<2") @ 10'.
		85%			
12					
		100%		SM	**SILTY SAND**; light gray (10YR 7/1), loose, saturated, trace clay, clay increasing with depth.
14					
		100%			
16					Color change to light brownish gray (10YR 6/2) @ 15'9".
		100%			
18					Large chunk of wood (~1.5") @ 18'.
		0%			
20					

Continued Next Page

Drilling Log

Monitoring Well **16WW58**

Project *Longhorn Army Ammunition Plant* Owner *U.S. Army*

Location *LHAAP-16* Proj. No. *501032*

Depth (ft.)	PID (ppm)	Sample ID % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
					Continued
20		50%		SC	**CLAYEY SAND**; dark gray (10YR 4/1), loose to medium dense, saturated, clay increasing with depth, fine to medium grain.
22				SM	**SILTY SAND**; light gray (10YR 7/1), firm, saturated, trace clay.
		100%		SC	**CLAYEY SAND**; light gray (10YR 7/1), loose, saturated, some silt.
24					
		100%			
26					
		100%			Clay lenses 26'9" to 27'.
28				SM	**SILTY SAND**; light gray (10YR 7/1), loose to medium dense, saturated, trace clay, fine medium grain.
		100%			
30					
		100%			Medium to coarse grain sand @ 31'.
32					
		100%			Interbedded silt lenses @ 33'6".
34					Back to fine to medium grain @ 34'3".
		75%			
36					
		100%			
38				CL	**SILTY CLAY**; gray (10YR 5/1), hard, damp, trace sand.
		100%			
40					**END OF BORING AT 40 FEET.**
42					
44					
46					

APTIM

WELL DEVELOPMENT LOG

PROJECT: LHAAP-16			**WELL ID:** 16 IW 09
Performed By: [illegible]	**Signature:** [illegible]	**Completion Date:**	**Development Date:** 11-13-18 / 11-14-18
Water Level Initial: 6.11	Final: 15.10	**Develop Method:** Surge / Surge Mini-Monsoon	**Total Vol. Dev:** 23 gallons
Weather: 11-13 OC 51°F / 11-14 OC 60°F	**Screen Interval:**	Top:	Bottom:
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 22.23 Final: 22.23

Time	Cum Volume (Liters)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1600	5	19.84	6.35	0.757	2012.3	3.38	133.7	14.20	
1605	10	19.94	6.44	0.871	2001.1	3.08	124.4	21.00	
	pump dry			DTW					
	11-14-18			DTW	6.17				
1130	5	19.72	5.76	0.576	2009.1	6.97	144.4	15.00	
1135	8	19.71	6.27	1.048	1921.5	6.15	169.8	22.00	
			DTW	14.00	1337		/ pump on		
1342	5	20.33	5.98	1.073	2018.1	7.16	167.4	15.10	
	pump dry								

Remarks

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS	**WELL ID: 16IW10**

Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/1/2018	**Development Date:** 5/3/2018
Water Level Final: Initial: 21.41 Final: 27.92		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 50
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 19.5	Bottom: 29.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole		**Total Depth:** Initial: 30	Final: 30

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
8:30	4	17.38	4.69	4.583	432.705	9.95	129.8	NR	murky
9:31	13	17.27	6.99	5.363	48.03	9.37	116.0	NR	murky
10:32	22	17.19	7.00	6.143	15.82	8.09	102.2	NR	clear
11:33	41	17.15	6.99	6.145	7.82	7.79	100.9	NR	clear
12:35	50	17.16	6.97	6.146	7.8	7.77	101	27.92	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS	**WELL ID: 16IW20**

Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/3/2018	**Development Date:** 5/5/2018
Water Level Final: Initial: 16.61 Final: 23.19		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 25
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 15	Bottom: 25

Wetted Volume:
.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole

Total Depth:
Initial: 25.5 **Final: 25.5**

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
8:00	1	17.33	6.51	4.795	1032.1	6.26	134.7	NR	murky
8:45	10	17.22	6.50	5.575	114.6	5.68	120.9	NR	Dry
9:30	25	17.14	6.48	6.355	38.0	4.40	107.1	NR	clear, dry
10:15	20	17.10	6.47	6.357	18.9	4.10	105.8	NR	clear
11:00	25	17.11	6.45	6.358	18.9	4.08	105.9	23.19	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS	**WELL ID: 16IW25**

Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/1/2018	**Development Date:** 5/5/2018
Water Level Final: Initial: 32.4 Final: 43.61		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 55
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 43.5	Bottom: 53.5

Wetted Volume: **.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole**	**Total Depth:** **Initial: 54** **Final: 54**

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
13:00	9	18.86	6.83	12.14	524.51	5.49	111.2	NR	murky
13:48	18	18.75	6.82	12.92	58.23	4.91	97.4	NR	murky
14:37	27	18.67	6.80	13.70	19.22	3.63	83.6	NR	clear
15:26	46	18.63	6.79	13.70	9.52	3.33	82.3	NR	clear
16:15	55	18.64	6.77	13.70	9.50	3.31	82.4	43.61	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16IW26**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/2/2018	**Development Date:** 5/5/2018
Water Level Final: Initial: 31.6 Final: 48.61		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 54
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 42.5	Bottom: 52.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 53 Final: 53

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
12:00	8	19.15	6.73	5.74	967.31	5.60	108.4	NR	murky
13:07	17	19.04	6.72	6.52	107.43	5.02	94.6	NR	murky
14:15	26	18.96	6.70	7.30	35.62	3.74	80.8	NR	clear
15:22	45	18.92	6.69	7.30	17.72	3.44	79.5	NR	clear
16:30	54	18.93	6.67	7.30	17.70	3.42	79.6	48.61	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16IW27**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/2/2018	**Development Date:** 5/4/2018
Water Level Final: Initial: 27.2 Final: 39.51		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 53
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 47.5	Bottom: 57.5
Wetted Volume: **.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole**			**Total Depth:** **Initial: 48** **Final: 48**

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
8:00	7	18.52	6.21	2.126	826.91	3.11	-19.6	NR	murky
9:02	16	18.41	6.20	2.906	91.83	2.53	-33.4	NR	murky
10:05	25	18.33	6.18	3.686	30.42	1.25	-47.2	NR	clear
11:07	44	18.29	6.17	3.688	15.12	0.95	-48.5	NR	clear
12:10	53	18.30	6.15	3.689	15.10	0.93	-48.4	39.51	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16IW28**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/1/2018	**Development Date:** 5/4/2018
Water Level Final: Initial: 27.2 Final: 39.51		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 54
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 41.5	Bottom: 51.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 52 Final: 52

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
8:00	8	18.63	6.51	2.671	514.79	3.86	10.4	NR	murky
8:56	17	18.52	6.50	3.451	57.15	3.28	-3.4	NR	murky
9:52	26	18.44	6.48	4.231	18.86	2.00	-17.2	NR	clear
10:48	45	18.40	6.47	4.233	9.34	1.70	-18.5	NR	clear
11:45	54	18.41	6.45	4.234	9.32	1.68	-18.4	39.51	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16IW29**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/1/2018	**Development Date:** 5/3/2018
Water Level Final: Initial: 24.62 Final: 41.29		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 100
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 38.5	Bottom: 48.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 49 Final: 49

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
13:00	54	18.47	6.27	1.322	108.705	3.12	21.4	NR	murky
13:48	63	18.36	6.26	2.102	12.03	2.54	7.6	NR	murky
14:37	72	18.28	6.24	2.882	3.82	1.26	-6.2	NR	clear
15:26	91	18.24	6.23	2.884	1.82	0.96	-7.5	NR	clear
16:15	100	18.25	6.21	2.885	1.8	0.94	-7.4	41.29	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16IW30**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 4/30/2018	**Development Date:** 5/3/2018
Water Level Final: Initial: 30.51 Final: 38.61		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 54
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 33.5	Bottom: 43.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 44 Final: 44

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
13:00	8	18.42	6.53	-0.163	551.51	2.11	-8.6	NR	murky
13:48	17	18.31	6.52	0.617	61.23	1.53	-22.4	NR	murky
14:37	26	18.23	6.50	1.397	20.22	0.25	-36.2	NR	clear
15:26	45	18.19	6.49	1.399	10.02	-0.06	-37.5	NR	clear
16:15	54	18.2	6.47	1.400	10.00	-0.07	-37.4	38.61	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

APTIM

WELL DEVELOPMENT LOG

PROJECT: LHAAP-16			**WELL ID:** 16[illegible]MW01
Performed By: [illegible]	**Signature:** [illegible]	**Completion Date:**	**Development Date:** 11-13-18/11-14-18
Water Level Initial: 18.80	Final: 24.10 ~~18.80~~	**Develop Method:** Purge/Surge Mini-Monsoon	**Total Vol. Dev:** 65 gallons
Weather: 11-13-18 O/C 51°F / 11-14-18 O/C 60°F	**Screen Interval:**	Top:	Bottom:
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 26.03 Final: 28.35

Time	Cum Volume (Liters)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1505	5	19.13	7.01	2.768		2.15	131.9	22.35	
1510	10	18.86	6.86	2.425	2012.7	0.96	141.9	23.80	
1515	15	18.91	5.31	2.379	1994.1	1.45	201.9	27.00	
	Purged	dry							
		11-14-18		DTW	18.70'				
0945	5	18.85	4.95	2.551	220.1	2.55	208.1	21.10	
1005	10	18.76	5.17	2.301	638.1	3.84	222.4	23.00	
1018	15	18.75	5.20	2.227	890.1	4.25	216.1	23.40	
1054	20	19.02	5.20	2.167	415.1	4.03	207.1	25.25	
1106	25	18.	5.20	2.253	431.1	4.69	205.2	26.00	
	dry /		DTW @ 19.62				0 1437		
			purge						
1400	5	19.07	5.51	2.549	476.1	3.67	184.1	22.80	
1503	10	19.37	5.73	2.222	204.1	5.43	204.4	23.60	
1520	15	19.02	5.72	2.188	198.4	4.88	201.7	24.45	
1534	20	18.87	5.15	2.168	241.1	4.49	209.1	24.35	
1546	25	18.81	5.11	2.168	341.8	4.39	197.8	24.10	Turbidity reading below

Remarks

APTIM

WELL DEVELOPMENT LOG

PROJECT:			WELL ID:
LHAAP-16			16RW02
Performed By: MSM	Signature:	Completion Date: 10-12-18	Development Date: 10-17-18 10-18-18
Water Level Initial 11.72 Final: Final pump DRY release	Initial:	Develop Method: purge/Mini-monsoon surge	Total Vol. Dev: 41 gallons
Weather: 10-17-18 o/c 50 10-18-18 o/c 65	Screen Interval:	Top: 8	Bottom: 18
Wetted Volume: .016gal/ft 2" casing +.87 gal/ft sand pack for a borehole			Total Depth: Initial: 20.43 Final: 20.43

Time	Cum Volume ~~(Liters)~~ Gallons	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
10-17-18		1206 pump on							
1213	5	20.22	5.78	0.369	0.0	5.62	172.9	14.45	clear/surge
1220	10	21.17	5.72	0.315	0.0	6.49	181.7	16.40	clear/surge
1229	15	20.78	6.07	0.480	0.0	7.12	178.7	18.80	clear/surge
1235	17	19.91	6.34	0.572	0.0	7.08	172.0	20.42	clear/surge
	pump DRY / let release								
1338	DRW @ 1550 / 1340 pump on								
1345	5	20.10	6.13	0.366	0.0	6.63	172.1	17.46	clear/surge
1356	10	20.01	5.78	0.258	0.0	6.82	184.6	20.30	clear/surge
	pump DRY / let release overnight check again tomorrow								
10-18-18	1455 DRW @ 12.01 / 1517 Pump on								
1522	3	20.13	5.68	0.248	0.0	5.66	176.1	13.30	clear/surge
1532	6	21.21	5.32	0.217	0.0	6.63	189.6	14.70	clear/surge
1539	9	21.49	5.43	0.212	0.0	6.64	192.0	17.10	clear/surge
1541	12	21.48	5.44	0.214	0.0	6.67	194.1	19.60	clear/surge
1543	14	21.50	5.45	0.215	0.0	6.70	198.1	20.40	clear/surge
	pump DRY								

Remarks

APTIM

WELL DEVELOPMENT LOG

PROJECT: LHAAP-16			WELL ID: 16RW03
Performed By: MSM	Signature: [illegible]	Completion Date: 10-11-18	Development Date: 10-17-18 10-18-18
Water Level Initial: 18.71 Final: Final pump on Recharge	Initial:	Develop Method: purge / mini-monsoon surge	Total Vol. Dev: 3.5 gallons
Weather: 10-17-18 o/c 56 10-18-18 o/c 65	Screen Interval:	Top: 10'	Bottom: 20'
Wetted Volume: .016gal/ft 2" casing +.87 gal/ft sand pack for a borehole			Total Depth: Initial: 20.44 Final: 20.45

Time	Cum Volume (Liters)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
10-17-18			11:48 pump on						
1155	2.5	19.29	6.04	1.313	50.0	4.49	151.6	20.22	cloudy
	pump off / let recharge.								
1420	check recharge DTW @ 19.70								
	will try development again tomorrow.								
10-18-18		1506 pump on							
1508	1.0	19.68	6.03	1.180	54.4	4.82	158.1	20.31	cloudy
	pump off								

Remarks

WELL DEVELOPMENT LOG

APTIM

PROJECT: LHAAP-16			**WELL ID:** 16RW04
Performed By: MSM	**Signature:**	**Completion Date:**	**Development Date:** 11-13-18 / 11-14-18
Water Level Initial: 18.11	Final: 25.20 ~~19.08~~	**Develop Method:** purse/surge Mini-monsoon	**Total Vol. Dev:** 46 gallons
Weather: 11-13 OC 51°F / 11-14 OC 60F	**Screen Interval:**	**Top:**	**Bottom:**
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 25.50 Final: 25.50

Time	Cum Volume (Liters)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1350	5	18.48	5.72	1.043	1992.9	2.27	200.5	19.85	
1357	10	19.22	5.71	1.040	467.4	2.69	177.4	21.50	
1409	15	19.99	5.56	1.048	343.4	3.59	173.8	23.10	
1429	20	18.90	5.57	1.024	1995.9	1.95	152.1	24.30	
1437	23.0	18.88	5.31	1.070	1991.9	3.15	162.7	25.25	
1438	Pump OFF								
	11-14-18	DTW @ 18.03'							
0850	5	19.15	6.76	1.048	486	4.03	174.2	21.50	
0857	10	18.86	5.39	1.175	44.5	3.95	225.2	22.35	
0915	13	18.44	5.11	1.152	0.0	3.68	220.1	22.70	
0921	18	18.98	5.06	1.145	0.0	3.35	210.1	24.20	
0930	23	19.03	5.07	1.142	0.0	3.08	223.0	25.20	
	Pump OFF								

Remarks

APTIM

WELL DEVELOPMENT LOG

PROJECT:	WELL ID:
LHAAP-16	16 RW 05

Performed By:	Signature:	Completion Date:	Development Date:
MSM	[signature]	10-11-18	10-17-18 10-18-18

Water Level Initial:	Final:	Develop Method:	Total Vol. Dev:
11.47'	purges dry / Recharging	purge / Mini Monsoon Surge	10-17-18 10-18-18 / 28.5 gallons

Weather:	Screen Interval:	Top:	Bottom:
10-17-18 o/c 56 10-18-18 o/c 65		10'	20'

Wetted Volume:	Total Depth:
.016gal/ft 2" casing +.87 gal/ft sand pack for a borehole	Initial: 20.45 Final: 20.45

Time	Cum Volume (~~Liters~~) gallons	Water Quality Parameters: Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)	Water Level (Feet)	Comments
10-17-18 START									
1055	pump on								
1102	5	19.59	6.38	1.515	808.9	6.61	157.2	14.00	silty / Surge
1110	10	20.50	6.59	1.442	8.9	6.34	149.4	17.40	clear / Surge
1117	15	20.24	6.44	1.923	13.4	6.95	149.4	18.80	clear / Surge
1125	17	19.54	6.04	1.665	405.3	4.81	150.2	20.00	silty / Surge
	STOP pump / pump dry / let Recharge								
1143	Took a DTW to check Recharge DTW @ 19.40'								
1359	DTW @ 18.27								
1410	pump on								
1415	2.5	19.44	6.30	1.928	219.4	6.29	163.9	20.10	silty / pump DRY
	purges dry / let Recharge overnight / try again tomorrow 10-18-18								
10-18-18 Initial DTW 15.58' / Time 14:19 pump on									
1424	2.5	~~17.20~~ 19.65	6.60	1.781	203.9	6.54	146.0	17.20	silty / Surge
1429	5.0	~~18.55~~ 19.87	6.39	1.784	41.2	6.83	150.3	18.55	cloudy / Surge
1434	7.5	19.89	6.37	1.743	41.3	6.80	154.3	19.44	cloudy / Surge
1435	pump DRY / pump off / let Recharge.								
1456	DTW @ 19.00' / pump on								
1458	1.5	19.85	6.38	1.740	39.2	6.81	157.2	20.30	cloudy
	DRY								

Remarks

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16RW06**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 4/23/2018	**Development Date:** 4/25/2018
Water Level Final: Initial: 19.7 Final: 26		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 55
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 18.5	Bottom: 28.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 29 Final: 29

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
15:15	9	17.38	6.97	4.583	432.71	9.95	129.8	NR	murky
15:56	18	17.27	6.99	5.363	48.03	9.37	116.0	NR	murky
16:37	27	17.19	7.00	6.143	15.82	8.09	102.2	NR	clear
17:18	46	17.15	6.99	6.145	7.82	7.79	100.9	NR	clear
18:00	55	17.16	6.97	6.146	7.8	7.77	101	26	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: Longhorn AAP, Site 16 Monitoring and Injection Wells			**WELL ID:** 16RW07
Performed By: Best Drilling	**Development Oversight:** Allen Willmore (Aptim)	**Completion Date:** 4/20/2018	**Development Date:** 4/25/18
Water Level Final: 22.16	Initial: 21.8 ft btoc	**Develop Method:** pumping and surging	**Total Vol. Dev:** ~95 gallons
Weather: See Field Activity Daily Log	**Screen Interval:**	Top: 15 ft bgs	Bottom: 25 ft bgs
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 25.5 ft b Final: 25.5 ft b

Time	Cum Volume (Gallons)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
12:05	5	26.41	6.70	3.214	300.1	2.11	166.2	21.18	Turbidity too high to record
12:35	20	26.32	6.70	3.507	290.1	1.99	104.1	21.65	Turbidity too high to record
13:05	35	26.21	6.71	4.109	117.5	NR	98.5	NR	
13:35	45	26.17	6.70	4.848	68.6	NR	97.1	NR	
14:05	55	26.31	6.71	4.851	44.1	NR	96.8	NR	
14:35	65	26.21	6.71	4.858	23.6	1.54	88.2	21.85	
15:05	75	26.13	6.70	4.855	18.3	1.62	86.7	21.92	
15:35	85	26.31	6.70	4.852	8.7	1.69	87.2	22.10	
16:05	95	26.41	6.70	4.853	1.5	1.65	86.9	22.16	
NO DATA BELOW THIS LINE									

Remarks

Volumes purged are estimated.

WELL DEVELOPMENT LOG

PROJECT: Longhorn AAP, Site 16 Monitoring and Injection Wells			**WELL ID:** 16RW08
Performed By: Best Drilling	**Development Oversight:** Allen Willmore (Aptim)	**Completion Date:** 4/19/2018	**Development Date:** 4/25/18
Water Level Final: 26.61	Initial: 23.5 ft btoc	**Develop Method:** pumping and surging	**Total Vol. Dev:** ~70 gallons
Weather: See Field Activity Daily Log	**Screen Interval:**	Top: 15.5 ft bgs	Bottom: 25.5 ft bgs
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 27 ft bgs Final: 27 ft bgs

Time	Cum Volume (Gallons)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
12:00	5	26.08	6.69	2.803	NR	3.82	166.2	23.8	Turbidity too high to record
12:30	20	26.16	6.68	2.912	NR	2.42	104.1	24.1	Turbidity too high to record
13:00	35	26.29	6.68	3.729	952.5	2.19	98.5	24.51	
13:30	45	26.37	6.67	4.209	568.3	2.18	97.1	25.62	
13:45	55	26.43	6.65	4.341	315.2	2.32	96.8	25.69	
14:00	57.5	26.52	6.64	4.678	235.3	2.30	88.2	25.70	
14:10	60	26.75	6.62	4.710	120.3	2.28	86.7	25.72	
14:15	70	26.82	6.62	4.712	61.1	2.21	87.2	25.75	
14:20	80	26.90	6.62	4.714	35.1	2.19	86.9	25.78	
14:25	90	26.94	6.62	4.715	23.2	2.19	86.8	26.57	
14:30	100	26.98	6.62	4.715	15.5	2.18	86.2	26.61	
NO DATA BELOW THIS LINE									

Remarks

Volumes purged are estimated.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16RW09**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 4/19/2018	**Development Date:** 4/24/2018
Water Level Final: Initial: 25.3 Final: 32.1		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 55
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 20	Bottom: 30
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 30.5 Final: 30.5

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
15:00	9	27.20	6.75	3.152	1113.105	4.36	115.0	NR	murky
15:47	18	27.09	6.74	3.932	123.63	3.78	101.2	NR	murky
16:35	27	27.01	6.72	4.712	41.02	2.50	87.4	NR	clear
17:22	46	26.97	6.71	4.714	20.42	2.20	86.1	NR	clear
18:10	55	26.98	6.69	4.715	20.4	2.18	86.2	32.1	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16RW10**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 4/19/2018	**Development Date:** 4/24/2018
Water Level Final: Initial: 21.2	Final: 28.2	**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 90
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 18	Bottom: 28
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 30.5 Final: 30.5

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
15:10	44	27.20	6.51	3.115	610.905	4.44	156.9	NR	murky
15:51	53	27.09	6.53	3.895	67.83	3.86	143.1	NR	murky
16:32	62	27.01	6.54	4.675	22.42	2.58	129.3	NR	clear
17:13	81	26.97	6.53	4.677	11.12	2.28	128.0	NR	clear
17:55	90	26.98	6.51	4.678	11.1	2.26	128.1	28.2	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS	**WELL ID: 16RW11**

Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/3/2018	**Development Date:** 5/5/2018
Water Level Final: Initial: 16.78 Final: 22.34		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 25
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 15	Bottom: 25
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole		**Total Depth:** Initial: 25.5	Final: 25.5

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
8:00	1	17.30	6.88	3.849	357.11	6.24	131.2	NR	murky
8:45	10	17.19	6.87	4.629	39.63	5.66	117.4	NR	Dry
9:30	25	17.11	6.85	5.409	13.02	4.38	103.6	NR	clear, dry
10:15	20	17.07	6.84	5.411	6.42	4.08	102.3	NR	clear
11:00	25	17.08	6.82	5.412	6.40	4.06	102.4	22.34	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16RW12**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/4/2018	**Development Date:** 5/6/2018
Water Level Final: Initial: 23.62 Final: 29.42		**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 43
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 21.5	Bottom: 31.5
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 32 Final: 32

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
9:00	-3	18.05	6.90	5.663	1086.11	4.13	115.7	NR	murky
9:55	6	17.94	6.92	6.443	120.63	3.55	101.9	NR	murky
10:50	15	17.86	6.93	7.223	40.02	2.27	88.1	NR	clear
11:45	34	17.82	6.92	7.225	19.92	1.97	86.8	NR	clear
12:40	43	17.83	6.90	7.226	19.90	1.95	86.9	29.42	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

APTIM

WELL DEVELOPMENT LOG

PROJECT: CHMPS-16			WELL ID: 16 MW 48
Performed By: MSM	Signature: [signature]	Completion Date: 10-6-18	Development Date: 10-13-18 10-17-18
Water Level Initial: Initial/ 12.29 Final: Final/ 13.60 & Recharging	Develop Method: purse/Mini Monsoon Surge		Total Vol. Dev: 65 gallons
Weather: 10-13-18 76° Sunny 10-17-18 o/c 56°/10-18 65 o/c	Screen Interval:	Top: 10'	Bottom: 20'
Wetted Volume: .016gal/ft 2" casing +.87 gal/ft sand pack for a borehole			Total Depth: Initial: 20.40' Final: 20.43'

	Time	Cum Volume ~~(Liters)~~ Gallons	Water Quality Parameters: Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)	Water Level (Feet)	Comments
10-13-18	1529	5	20.27	6.45	5.829	1308.1	1.75	138.9	17.40	silty brown
10-13-18	1532	10	20.83	6.10	6.197	1794.5	1.42	153.2	18.50	silty brown
10-13-18	1536	15	20.25	6.00	6.000	1787.2	1.93	150.4	20.00	silty brown
10-13-18	1557	DRY	/ Heavy Rain & Thunderstorms							
	will let well Recharge & try again another day.									
	10-17-18	Continue again on well Development								
	0915	pump on								
	0919	5	19.35	5.92	6.678	1462.2	2.13	181.4	13.20	Heavy Silt / Surge
	0929	10	20.34	5.92	6.685	2322.5	2.93	173.8	13.40	Heavy Silt / Surge
	0936	15	20.41	5.87	6.852	1190.0	3.07	172.8	13.55	Heavy Silt / Surge
	0942	20	20.35	5.82	6.921	1806	2.45	170.5	13.65	cloudy / Surge
	0949	25	20.43	5.81	6.857	186.4	2.09	167.5	13.74	cloudy / Surge
	0959	30	20.32	5.78	6.833	181.4	1.60	165.7	13.60	cloudy / Surge
	1006	35	20.33	5.77	6.841	94.5	1.40	165.1	13.60	cloudy / Surge
	1012	40	20.25	5.77	6.852	0.0	1.43	164.0	13.60	clear / Surge
	1019	45	20.32	5.77	6.887	0.0	1.41	163.9	13.60	clear / Surge
	1026	50	20.32	5.78	6.872	0.0	1.40	165.9	13.60	clear / Surge
		pump off			TD	20.43'				

Remarks

WELL DEVELOPMENT LOG

APTIM

PROJECT: Longhorn AAP / LHAAP 16			**WELL ID:** 16WW49
Performed By: Michael Martinez	**Signature:**	**Completion Date:**	**Development Date:** August 28, 2019
Water Level **Initial:** 18.46' **Final:**		**Develop Method:** SP/SURGE	**Total Vol. Dev:** 40 gallons this event.
Weather: PC, Hi 92/Lo 73	**Screen Interval:**	Top:	Bottom:
Wetted Volume: **.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole**			**Total Depth:** **Initial:** 54.70' **Final:**

Time	Cum Volume (Liters)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1150	5.0	20.33	6.28	2.227	21.1	1.93	3.8	28.95	clear ,no odor/surge
1157	22.5	19.48	6.49	2.221	10.9	1.87	-47.8	44.80	clear ,no odor/surge
1202	35.0	19.46	6.67	2.164	11.6	1.77	-39.9	53.71	clear ,no odor/surge
1204	Well pumped dry. Well had been pured a few previously to this event of pumping on well.								

Remarks 1148 pump on.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16WW51**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 5/3/2018	**Development Date:** 5/5/2018
Water Level Final: Initial: 28.6	Final: 40.87	**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 70
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 34	Bottom: 44
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 44.5 Final: 44.5

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
10:20	24	18.45	4.69	2.530	972.705	4.00	9.3	NR	murky
10:57	33	18.34	6.47	3.310	108.03	3.42	-4.5	NR	murky
11:35	42	18.26	6.48	4.090	35.82	2.14	-18.3	NR	clear
12:12	61	18.22	6.47	4.092	17.82	1.84	-19.6	NR	clear
12:50	70	18.23	6.45	4.093	17.80	1.82	-19.5	40.87	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

PROJECT: LONGHORN AAP, SITE 16 MONITORING AND INJECTION WELLS			**WELL ID: 16WW55**
Performed By: BEST DRILLING	**Oversight: ALLEN WILLMORE**	**Completion Date:** 4/18/2018	**Development Date:** 4/24/2018
Water Level Final: Initial: 19.2	Final: 28.4	**Develop Method: PUMPING AND SURGING**	**Total Vol. Dev:** 55
Weather: SEE FADL	**Screen Interval (ft BTOC)**	Top: 20	Bottom: 30
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 30.5 Final: 30.5

Time	Cumulutive Volume (gallons)	Water Quality Parameters						Water Level (ft-btoc)	Comments
		Temp	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
12:55	9	18.89	4.69	5.136	1069.905	7.85	124.7	NR	murky
13:26	18	18.78	5.68	5.916	118.83	7.27	110.9	NR	murky
13:57	27	18.70	5.69	6.696	39.42	5.99	97.1	NR	clear
14:28	46	18.66	6.73	6.698	19.62	5.69	95.8	NR	clear
15:00	55	18.67	6.71	6.699	19.6	5.67	95.9	28.4	clear

Remarks: Spot checked for parameters. Geologist was logging holes and could not continuously record readings. Well Periodically went dry.

WELL DEVELOPMENT LOG

APTIM

PROJECT: CHAMP - KC			**WELL ID:** KCW56
Performed By: MSM	**Signature:** [signature]	**Completion Date:**	**Development Date:** 11-13-18
Water Level Initial: 27.18	Final: 29.80	**Develop Method:** Purge / Mini-monsoon Surge	**Total Vol. Dev:** 55 gallons
Weather: 11-13 0C 51°F / 11-14 0C 60°F	**Screen Interval:**	Top:	Bottom:
Wetted Volume: .016gal/ft 2' casing +.87 gal/ft sand pack for a borehole			**Total Depth:** Initial: 34.03 Final: 34.03

Time	Cum Volume (~~Liters~~) Gallons	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1111	5	17.56	6.56	5.217	1972.6	2.36	171.6	28.00	Turbid Silty Brown
1117	10	17.41	6.57	3.446	1979.1	2.94	165.1	28.40	
1124	15	18.62	6.25	3.431	330.1	1.25	159.5	28.70	
1130	20	18.56	6.24	3.484	288.1	1.78	157.7	28.85	
1135	25	18.57	6.21	3.514	254.1	1.40	157.9	29.00	
1141	30	18.53	6.43	3.558	170.4	1.35	159.1	29.10	
1146	35	18.56	6.20	3.603	48.5	1.87	161.9	29.39	
1153	40	18.52	6.21	3.679	65.3	1.94	163.2	29.58	
1200	45	18.53	6.22	3.678	75.6	1.94	162.6	29.74	
1205	50	18.80	6.36	3.740	75.6	1.96	159.1	29.85	
1210	55	18.46	6.25	3.741	75.2	1.98	160.2	29.90	

Remarks

WELL DEVELOPMENT LOG

PROJECT: Longhorn AAP / LHAAP 16			**WELL ID:** 16WW57
Performed By: Michael S. Martinez	**Signature:**	**Completion Date:**	**Development Date:** August 12, 2019
Water Level **Initial:** 4.90	**Final:** 5.70	**Develop Method:** SP/SURGE	**Total Vol. Dev:** 55 gallons
Weather: Sunny 96 F	**Screen Interval:** 10'	Top: 29.80'	Bottom: 39.80'
Wetted Volume: **.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole**			**Total Depth:** **Initial:** 39.80 **Final:** 39.80

Time	Cum Volume (GAL)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1300	15 gallons	28.06	6.04	5.166	19.0	1.49	36.2	11.65'	clear ,no odor/surge
1305	30 gallons	20.20	6.05	5.185	13.5	2.44	12.4	12.00'	clear, no odor/surge
1313	40 gallons	19.40	6.05	5.260	15.6	4.65	12.2	12.60'	clear, no odor /surge
1320	55 gallons	19.42	6.05	5.244	13.8	4.63	9.8	12.65'	clear, no odor/surge

Remarks

WELL DEVELOPMENT LOG

APTIM

PROJECT: Longhorn Army Ammunition Plant - LHAAP 16			**WELL ID:** 16WW58
Performed By: Michael S. Maritnez	**Signature:** Michael S. Maritnez	**Completion Date:**	**Development Date:** August 12, 2019
Water Level **Initial:** 6.54'	**Final:** 10.60'	**Develop Method:** SP/SURGE	**Total Vol. Dev:** 110 gallons
Weather: Sunny, 96 F	**Screen Interval:** 10'	Top: 31.80'	Bottom: 41.80'
Wetted Volume: **.016gal/ft 2' casing +.87 gal/ft sand pack for a borehole**			**Total Depth:** **Initial:** 41.80' **Final:** 41.80'

Time	Cum Volume (GAL)	Water Quality Parameters						Water Level (Feet)	Comments
		Temp (°C)	pH	Cond (mS/cm)	Turb (NTU)	D.O. (mg/L)	Redox (mV)		
1345	25 gallons	20.24	6.45	2.577	151.0	1.06	151.0	30.00	light silt, no odor/surge
1350	stiop pump and let recharge, DTW @ 32.60'								
1400	DTW RECHARGE @ 9.00'								
14.05	Restart pump								
1410	38	19.22	6.37	2.591	41.4	7.02	-68.1	29.60	light silt, no odor/surge
1415	48	19.39	6.35	2.575	45.6	1.67	-74.7	32.95	light silt, no odor/surge
	Drum full/ETTL HAD TO GO AND GET ANOTHER DRUM								
1425	DTW @ 10.60' / RESTART PUMP								
1427	5	19.63	6.35	2.625	51.4	2.94	-69.7	29.80	light silt, no odor/surge
1430	13.5	19.83	6.30	2.603	24.3	2.95	-87.1	34.92	light silt, no odor/surge
1437	30	19.90	6.31	2.675	28.3	2.99	-68.1	35.00	light silt, no odor/surge
1440	37.5	19.80	6.31	2.587	28.7	3.00	-61.2	35.70	light silt, no odor/surge
1450	55	19.90	6.31	2.613	29.7	2.59	-64.1	36.10	light silt, no odor/surge
	Done with well development/ Purged a total of 110 gallons./ Well recharges very quickly.								

Remarks 1334 Start pump

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • April 2021

Appendix C

Sample Collection Logs

Note: The sample collection logs (SCLs) include revisions to values that had previously been based on database information that was later determined to be erroneous. These values include screen interval, constructed depth, and depth to well bottom. The original monitoring well logs and survey information (top of casing and ground surface elevations) were used where necessary to correct these values. Also, the "Sample Interval" has been struck from the upper right corner of some forms where it was used to represent the range of depth-to-water values recorded during the purging of the wells.

At some sample locations, the sample was collected before all field parameters had fully stabilized per the criteria presented in the Installation-Wide Work Plan (Bhate 2018b).

01028753

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW02**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW02-181009

DATE/TIME: 10/9/2018 / 13:40

Pump Inlet Depth (ft): 24.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First Gauge: 24.48. Second Gauge: 24.59. Perchlorate sample field filtered with 0.2 micron groundwater filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 6

Purge Start Date/Time: 10/9/2018 / 13:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 13:40

Constructed Depth to Well Bottom (ft) ~~31~~ 29.75 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~22.00 - 27.00~~ 21.75-26.75 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 13:10

01028754

APTIM

Sample Collection Log

Location ID: 16EW02 Sample No: 16EW02-181009										
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
10/9/2018	13:10	75	.375	24.48	3.000	24.8	6.54	181.0	87.8	3.89
10/9/2018	13:15	75	.750	24.51	5.343	24.03	6.13	181.5	81.2	2.30
10/9/2018	13:20	100	1.250	24.53	5.301	24.01	6.08	181.1	80.7	2.04
10/9/2018	13:25	125	1.875	24.56	5.189	23.97	6.02	181.2	79.0	1.64
10/9/2018	13:30	125	2.500	24.56	5.055	23.99	6.00	181.3	80.3	1.35
10/9/2018	13:35	125	3.125	24.57	4.986	24.12	6.00	181.4	77.0	1.26
10/9/2018	13:40	125	3.750	24.59	4.950	24.23	6.00	181.6	80.2	1.16

01028755

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW05**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Clear, Air Temp:52, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW05-181011

DATE/TIME: 10/11/2018 / 11:01

Pump Inlet Depth (ft): 49.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 28.58' / 28.58'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 6

Purge Start Date/Time: 10/11/2018 / 10:17

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/11/2018 / 11:01

Constructed Depth to Well Bottom (ft) ~~55~~ 54.43 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~47.00 - 52.00~~ 46.43-51.43 FT BTOC

L George 05/21/2020

Pump Start Time: 10/11/2018 / 10:17

Location ID: 16EW05 Sample No: 16EW05-181011										
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
10/11/2018	10:36	125	1.0	28.76	10.16	19.58	6.19	168.9	195.3	1.03
10/11/2018	10:41	125	1.625	28.53	10.25	19.84	6.18	476.5	197.7	0.83
10/11/2018	10:46	125	2.25	28.89	10.29	19.89	6.18	488.7	191.7	0.96
10/11/2018	10:51	125	2.875	28.94	10.28	19.92	6.18	168.2	190.9	0.95
10/11/2018	10:56	125	3.5	28.99	10.29	19.89	6.17	167.1	190.1	0.74
10/11/2018	11:01	125	4.125	29.06	10.32	19.94	6.17	167.9	189.9	0.74

01028756

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW06**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Light Rain, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW06-181009

DATE/TIME: 10/9/2018 / 14:55

Pump Inlet Depth (ft): 52.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 24.26. Second gauge: 24.26. Perchlorate field filtered with 0.2 micron groundwater filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 6

Purge Start Date/Time: 10/9/2018 / 14:25

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:55

Constructed Depth to Well Bottom (ft) ~~58~~ 57.72 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~50.00 - 55.00~~ 49.72-54.72 FT BTOC

L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:25

APTIM

Sample Collection Log

01028757

Location ID: 16EW06 Sample No: 16EW06-181009										
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
10/9/2018	14:25	100	0.500	24.26	9.536	25.31	5.96	158.7	89.2	2.96
10/9/2018	14:30	100	1.00	24.27	9.890	24.90	5.90	29.4	78.2	2.06
10/9/2018	14:35	125	1.625	24.28	10.08	24.72	5.86	168.1	69.2	1.63
10/9/2018	14:40	125	2.250	24.31	10.17	24.70	5.86	142.0	62.1	1.24
10/9/2018	14:45	125	2.875	24.32	10.22	24.64	5.85	83.0	59.6	1.10
10/9/2018	14:50	125	3.500	24.33	10.22	24.69	5.85	171.0	58.7	1.04
10/9/2018	14:55	125	4.125	24.33	10.25	24.76	5.84	154.6	59.3	0.95

01028758

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW07**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:70, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW07-181013

DATE/TIME: 10/13/2018 / 11:00

Pump Inlet Depth (ft): 43.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 14.36, Second Gauge: 14.36

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 6

Purge Start Date/Time: 10/13/2018 / 11:00

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 11:00

Constructed Depth to Well Bottom (ft) 49 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): 41.00 - 46.00 FT BTOC
L George 05/21/2020

Pump Start Time: 10/13/2018 / 11:00

APTIM

Sample Collection Log

01028759

Location ID: 16EW07 Sample No: 16EW07-181013										
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
10/13/2018	10:25	300	1.500	14.36	10.32	19.71	6.04	13.1	294.7	6.30
10/13/2018	10:30	175	2.375	14.52	10.52	19.56	6.45	6.7	83.6	4.66
10/13/2018	10:35	175	3.250	14.59	10.54	19.60	6.72	4.1	-19.1	3.10
10/13/2018	10:40	175	4.125	14.59	10.54	19.65	6.85	3.0	-60.7	2.66
10/13/2018	10:45	175	5.000	14.63	10.56	19.69	6.99	1.5	-96.7	2.13
10/13/2018	10:50	200	6.000	14.64	10.55	19.71	7.04	0.0	-111.4	1.91
10/13/2018	10:55	150	6.750	14.66	10.55	19.72	7.09	-0.8	-122.7	1.74
10/13/2018	11:00	200	7.750	14.67	10.56	19.74	7.12	-1.0	-130.9	1.62

01028760

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW08**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:71, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW08-181013

DATE/TIME: 10/13/2018 / 10:45

Pump Inlet Depth (ft): 36.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 6

Purge Start Date/Time: 10/13/2018 / 10:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 10:45

Constructed Depth to Well Bottom (ft) ~~42~~ 41.76 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~34.00 - 39.00~~ 33.76-38.76 FT BTOC

L George 05/21/2020

Pump Start Time: 10/13/2018 / 10:10

Location ID: 16EW08 Sample No: 16EW08-181013										
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
10/13/2018	10:15	140	1.0	9.50	1.085	19.09	6.44	9.1	-24.9	1.23
10/13/2018	10:20	140	1.7	9.52	1.096	19.08	6.33	11.9	-23.6	0.98
10/13/2018	10:25	140	2.4	9.54	1.099	19.08	6.29	10.9	-22.8	0.54
10/13/2018	10:30	140	3.1	9.58	1.103	19.11	6.27	9.9	-22.4	0.52
10/13/2018	10:35	140	3.8	9.60	1.112	19.13	6.25	9.7	-20.9	0.48
10/13/2018	10:40	140	4.5	9.61	1.119	19.15	6.23	7.7	-16.9	0.46
10/13/2018	10:45	140	3.2	9.61	1.117	19.13	6.23	8.8	-16.0	0.48

01028761

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW11**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:76, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW11-181013

DATE/TIME: 10/13/2018 / 12:55

Pump Inlet Depth (ft): 24.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice 20.76' / 20.76'.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/13/2018 / 12:20

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 12:55

Constructed Depth to Well Bottom (ft) 33 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~19.50 - 29.50~~ 23-33 FT BTOC
L George 05/21/2020

Pump Start Time: 10/13/2018 / 12:20

Location ID: 16EW11 Sample No: 16EW11-181013										
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
10/13/2018	12:25	100	1.0	21.21	5.802	20.50	6.27	7.6	-75.3	1.21
10/13/2018	12:30	100	1.5	21.31	5.802	20.13	6.24	16.0	-77.3	0.57
10/13/2018	12:35	100	2.0	21.35	5.799	20.31	6.26	8.1	-77.6	0.42
10/13/2018	12:40	100	2.5	21.35	5.793	20.42	6.28	7.4	-77.6	0.38
10/13/2018	12:45	100	3.0	21.35	5.797	20.40	6.30	8.8	-78.1	0.30
10/13/2018	12:50	100	3.5	21.35	5.794	20.43	6.31	8.9	-78.3	0.29
10/13/2018	12:55	100	4.0	21.35	5.791	20.45	6.31	9.0	-79.2	0.28

01028762

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW12B**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:76, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW12B-181013

DATE/TIME: 10/13/2018 / 13:30

Pump Inlet Depth (ft): 18

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice 17.46' / 17.46'.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/13/2018 / 13:00

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 13:30

Constructed Depth to Well Bottom (ft)

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~13:00 - 23:00~~
L George 05/21/2020

Pump Start Time: 10/13/2018 / 13:00

Location ID: 16EW12B Sample No: 16EW12B-181013										
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
10/13/2018	13:05	100	1.0	17.80	6.256	20.26	6.26	0.4	-61.7	1.03
10/13/2018	13:10	100	1.5	17.84	6.251	20.27	6.24	0.0	-63.4	0.78
10/13/2018	13:15	100	2.0	17.88	6.246	20.30	6.23	0.0	-66.2	0.34
10/13/2018	13:20	100	2.5	17.90	6.248	20.25	6.23	0.0	-71.7	0.28
10/13/2018	13:25	100	3.0	17.90	6.246	20.28	6.23	0.0	-72.5	0.24
10/13/2018	13:30	100	3.5	17.90	6.245	20.29	6.23	0.0	-72.7	0.25

01028763

Sample Collection Log

APTIM

Project Name: **Longhorn AAP**

Location ID: **16EW13**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:76, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW13-181013

DATE/TIME: 10/13/2018 / 14:05

Pump Inlet Depth (ft): 25

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 17.40, Second Gauge: 17.40

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/13/2018 / 13:35

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 14:05

Constructed Depth to Well Bottom (ft) 29.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~25.00 - 25.00~~ 18.3-28.3 FT BTOC
L George 05/21/2020

Pump Start Time: 10/13/2018 / 13:35

APTIM

Sample Collection Log

01028764

Location ID: 16EW13 Sample No: 16EW13-181013										
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
10/13/2018	13:35	100	.500	17.40	12.29	21.34	5.88	38.1	15.5	2.80
10/13/2018	13:40	100	1.000	17.75	12.24	20.95	5.81	30.8	-15.0	2.15
10/13/2018	13:45	100	1.500	17.76	12.19	21.18	5.80	30.6	-33.1	1.56
10/13/2018	13:50	100	2.000	17.78	12.19	21.25	5.80	27.3	-36.4	1.36
10/13/2018	13:55	100	2.500	17.79	12.19	21.30	5.80	25.0	-39.1	1.23
10/13/2018	14:00	200	3.500	17.87	12.20	21.34	5.81	21.6	-40.7	1.13
10/13/2018	14:05	200	4.500	17.93	12.19	20.97	5.81	24.4	-43.2	1.05

01028765

Sample Collection Log

APTIM

Project Name: **Longhorn AAP**

Location ID: **16EW14B**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Sunny, Air Temp:76, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW14B-181013

DATE/TIME: 10/13/2018 / 13:20

Pump Inlet Depth (ft): 19.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 16.73, Second Gauge: 16.73

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/13/2018 / 12:40

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 13:20

Constructed Depth to Well Bottom (ft)

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~14.50 - 24.50~~

L George 05/21/2020

Pump Start Time: 10/13/2018 / 12:40

APTIM

Sample Collection Log

01028766

Location ID: 16EW14B Sample No: 16EW14B-181013										
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
10/13/2018	12:40	100	.500	16.73	13.42	22.26	6.23	209.0	38.8	3.82
10/13/2018	12:45	100	1.000	16.91	14.59	20.97	5.73	9.7	21.9	2.49
10/13/2018	12:50	100	1.500	16.92	15.31	21.08	5.70	4.6	15.5	1.88
10/13/2018	13:00	100	2.000	16.92	14.97	21.12	5.72	6.8	10.7	1.49
10/13/2018	13:10	125	2.625	16.93	14.50	21.21	5.72	4.2	7.4	1.28
10/13/2018	13:15	125	3.250	16.93	14.36	21.18	5.72	6.2	6.7	1.21
10/13/2018	13:50	125	3.875	16.94	14.00	21.13	5.72	19.9	4.8	1.14

01028767

Sample Collection Log

APTIM

Project Name: **Longhorn AAP**

Location ID: **16EW15**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Partly Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16EW15-181013

DATE/TIME: 10/13/2018 / 12:20

Pump Inlet Depth (ft): 19

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 17.84. Second Gauge: 17.84

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/13/2018 / 11:45

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/13/2018 / 12:20

Constructed Depth to Well Bottom (ft) 27 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~14.00 - 24.00~~ 17-27 FT BTOC
L George 05/21/2020

Pump Start Time: 10/13/2018 / 11:45

APTIM

Sample Collection Log

01028768

Location ID: 16EW15 Sample No: 16EW15-181013										
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
10/13/2018	11:45	200	1.000	17.84	17.17	22.65	7.00	79.1	-36.6	5.01
10/13/2018	11:50	200	2.000	18.33	17.25	21.85	7.06	76.8	-115.0	3.12
10/13/2018	11:55	100	2.500	18.50	17.22	22.90	7.07	70.8	-130.9	2.04
10/13/2018	12:00	100	3.000	18.62	17.23	23.66	7.08	75.2	-133.8	1.69
10/13/2018	12:05	100	3.500	18.73	17.27	24.02	7.07	73.5	-131.6	1.53
10/13/2018	12:10	100	4.000	18.84	17.30	24.60	7.08	77.7	-131.4	1.31
10/13/2018	12:15	100	4.500	18.96	17.28	25.25	7.08	78.4	-130.7	1.15
10/13/2018	12:20	100	5.000	18.97	17.29	25.77	7.07	75.5	-134.0	1.09

01028769

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16SW01**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Clear, Air Temp:71, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16SW01-181011**

DATE/TIME: 10/11/2018 / 13:55

Pump Inlet Depth (ft):

Sampling Method: GR

Sample Purpose: REG

Sample Matrix: SW

Sample Notes: 16SW01-181011-FD + MS/MSD. Gauged DTW twice at 16WW46, 22.02FT / 22.02FT. Perchlorate field filtered w/ 0.2 micron filter. Collecte samples with disposable bailer.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-SW-ALSHT-181011-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

01028770

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16SW01**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Clear, Air Temp:71, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16SW01-181011-FD**

DATE/TIME: 10/11/2018 / 13:30

Pump Inlet Depth (ft):

Sampling Method: GR

Sample Purpose: FD

Sample Matrix: SW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:		Mike Martinez	
QC'ed By:			

01028771

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16SW02**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Clear, Air Temp:71, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16SW02-181011**

DATE/TIME: 10/11/2018 / 15:10

Pump Inlet Depth (ft):

Sampling Method: GR

Sample Purpose: REG

Sample Matrix: SW

Sample Notes: Gauged DTW twice at 16WW40, 12.31' / 12.31'. Perchlorate field filtered w/ 0.2 micron filter. Collecte samples with disposable bailer

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-SW-ALSHT-181011-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

01028772

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16SW03**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Clear, Air Temp:71, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16SW03-181011**

DATE/TIME: 10/11/2018 / 16:30

Pump Inlet Depth (ft):

Sampling Method: GR

Sample Purpose: REG

Sample Matrix: SW

Sample Notes: Gauged DTW twice at 16WW43, 10.43' / 10.43''. Perchlorate field filtered w/ 0.2 micron filter. Collecte samples with disposable bailer

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-SW-ALSHT-181011-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

01028773

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW12**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW12-181012**

DATE/TIME: 10/12/2018 / 13:50

Pump Inlet Depth (ft): 19

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Perchlorate field filtered w/ 0.2 micron filter. Gauged DTW twice 18.63' / 18.63'

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 13:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 13:50

Constructed Depth to Well Bottom (ft) ~~24~~ 26.64 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~14.00 - 24.00~~ 16.64-26.64 FT BTOC

L George 05/21/2020

Pump Start Time: 10/12/2018 / 13:10

APTIM

Sample Collection Log

01028774

Location ID: 16WW12 Sample No: 16WW12-181012										
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
10/12/2018	13:15	200	1.0	18.78	6.655	19.43	5.81	51.5	109.1	1.01
10/12/2018	13:20	200	2.0	18.78	6.628	19.31	5.73	34.3	117.1	0.96
10/12/2018	13:25	200	3.0	18.78	6.630	19.25	5.73	22.4	121.7	0.77
10/12/2018	13:30	200	4.0	18.78	6.622	19.28	5.74	10.1	123.6	0.54
10/12/2018	13:35	200	5.0	18.78	6.617	19.30	5.74	9.9	126.5	0.48
10/12/2018	13:40	200	6.0	18.78	6.616	19.17	5.74	4.6	128.8	0.36
10/12/2018	13:45	200	7.0	18.78	6.610	19.14	5.74	0.0	129.2	0.36
10/12/2018	13:50	200	8.0	18.78	6.607	19.13	5.74	0.0	130.1	0.36

01028775

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW13**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW13-181012**

DATE/TIME: 10/12/2018 / 15:15

Pump Inlet Depth (ft): 19

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 9.06; Second gauge: 9.06. Perchlorate Sample field filtered with 0.2 micron water filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 14:45

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 15:15

Constructed Depth to Well Bottom (ft) ~~24~~ 26.73 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~14.00 - 24.00~~ 16.73-26.73 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 14:45

APTIM

Sample Collection Log

01028776

Location ID: 16WW13 Sample No: 16WW13-181012										
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
10/12/2018	11:45	300	1.500	9.06	10.85	20.80	4.73	182.4	294.3	3.77
10/12/2018	14:50	200	2.500	9.54	10.95	20.39	4.68	189.0	271.5	2.85
10/12/2018	14:55	125	3.125	9.78	10.96	21.07	4.68	203.5	244.9	1.78
10/12/2018	15:00	125	3.750	9.94	10.97	21.06	4.67	208.5	236.3	1.44
10/12/2018	15:05	125	4.375	10.03	10.96	21.08	4.67	209.9	229.3	1.24
10/12/2018	15:10	125	5.000	10.06	10.95	21.07	4.67	218.6	223.4	1.08
10/12/2018	15:15	125	5.625	10.07	10.94	21.16	4.68	222.8	225.7	1.02

01028777

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW14**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW14-181010**

DATE/TIME: 10/10/2018 / 12:02

Pump Inlet Depth (ft): 22

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 26.71' / 26.71'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 11:33

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 12:02

Constructed Depth to Well Bottom (ft) ~~29~~ 32.63 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~17.00 - 27.00~~ 20.63-30.63 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 11:33

Location ID: 16WW14 Sample No: 16WW14-181010										
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
10/10/2018	11:37	150	1.0	26.88	4.428	21.24	6.39	141.7	47.4	1.25
10/10/2018	11:42	150	1.75	26.88	4.392	21.23	6.03	108.4	51.3	0.68
10/10/2018	11:47	150	2.50	26.92	4.387	21.40	5.97	152.4	52.5	0.62
10/10/2018	11:52	150	3.25	26.96	4.376	24.56	5.94	167.1	54.3	0.52
10/10/2018	11:57	150	4.0	26.96	4.368	21.63	5.93	59.6	55.8	0.48
10/10/2018	12:02	150	4.75	26.96	4.360	21.67	5.93	38.1	57.1	0.44

01028778

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW16**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Mostly Cloudy, Air Temp:78, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW16-181010**

DATE/TIME: 10/10/2018 / 13:15

Pump Inlet Depth (ft): 24

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 23.28; Second Gauge: 23.28; Perchlorate sample field filtered through 0.2 micron filter for groundwater

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 12:40

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 13:15

Constructed Depth to Well Bottom (ft) ~~29~~ 31.62 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~19.00 - 29.00~~ 21.62-31.62 FT BTOC

L George 05/21/2020

Pump Start Time: 10/10/2018 / 12:40

APTIM

Sample Collection Log

01028779

Location ID: 16WW16 Sample No: 16WW16-181010										
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
10/10/2018	12:40	200	1.0	23.28	6.358	21.41	6.13	134.3	297.8	3.21
10/10/2018	12:45	175	1.875	23.38	6.355	21.53	6.11	129.4	283.7	2.27
10/10/2018	12:50	150	2.625	23.39	3.365	21.89	6.06	142.1	268.6	1.70
10/10/2018	12:55	150	3.375	23.39	6.379	21.75	6.07	139.9	240.5	1.32
10/10/2018	13:00	150	4.125	23.40	6.405	22.33	6.03	134.7	225.5	1.17
10/10/2018	13:05	150	4.875	23.40	6.477	21.55	6.10	137.1	214.3	1.11
10/10/2018	13:10	150	5.625	23.43	6.398	21.12	6.19	132.2	200.9	1.03
10/10/2018	13:15	150	6.375	23.43	6.424	20.82	6.10	136.2	193.6	0.96

01028780

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW21**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW21-181012**

DATE/TIME: 10/12/2018 / 15:40

Pump Inlet Depth (ft): 95

Sampling Method: Bladder Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice, 26.75' / 26.75''. Perchlorate field filtered w/ 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 14:55

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 15:40

Constructed Depth to Well Bottom (ft) ~~101~~ 103.21 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~90.00 - 100.00~~ 93.21-103.21 FT BTOC

L George 05/21/2020

Pump Start Time: 10/12/2018 / 14:55

APTIM

Sample Collection Log

01028781

Location ID: 16WW21 Sample No: 16WW21-181012										
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
10/12/2018	15:05	100	1.0	26.90	0.696	20.36	6.80	79.8	127.1	2.30
10/12/2018	15:10	100	1.5	26.90	0.663	20.19	6.12	77.5	140.8	1.73
10/12/2018	15:15	100	2.0	26.90	0.573	20.06	5.67	74.8	154.2	1.16
10/12/2018	15:20	100	2.5	26.90	0.549	20.14	5.58	75.3	159.0	0.91
10/12/2018	15:25	100	3.0	26.90	0.545	20.15	5.56	81.4	159.8	0.83
10/12/2018	15:30	100	3.5	26.90	0.543	20.16	5.55	88.0	161.0	0.80
10/12/2018	15:35	100	4.0	26.90	0.541	20.13	5.52	89.4	165.4	0.83
10/12/2018	15:40	100	4.5	26.90	0.540	20.15	5.52	86.3	166.4	0.82

01028782

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW22**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Sunny, Air Temp:85, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW22-181010**

DATE/TIME: 10/10/2018 / 15:00

Pump Inlet Depth (ft): 26

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First Gauge: 29.17; Second Gauge: 29.17. Perchlorate Sample field filtered with 0.2 micron groundwater filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 14:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 15:00

Constructed Depth to Well Bottom (ft) ~~32~~ 33.94 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~21.00 - 31.00~~ 23.94-33.94 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 14:30

APTIM

Sample Collection Log

01028783

Location ID: 16WW22 Sample No: 16WW22-181010										
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
10/10/2018	14:30	200	1.00	29.17	5.631	22.51	5.67	133.9	114.5	2.20
10/10/2018	14:35	200	2.00	29.35	5.624	22.42	5.63	136.2	110.4	2.02
10/10/2018	14:40	175	2.875	29.41	5.631	22.20	5.61	139.7	96.9	1.46
10/10/2018	14:45	125	3.50	29.44	5.681	22.12	5.64	135.1	87.7	1.26
10/10/2018	14:50	125	4.125	29.51	5.800	21.62	5.77	134.4	74.6	1.06
10/10/2018	14:55	100	4.625	29.51	5.877	21.46	5.79	133.1	70.0	1.00
10/10/2018	15:00	100	5.25	29.53	5.988	20.82	5.86	135.7	68.3	0.89

01028784

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW23**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:74, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW23-181012

DATE/TIME: 10/12/2018 / 11:55

Pump Inlet Depth (ft): 29

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 9.23, Second gauge: 9.23. Perchlorate Sample field filttered with 0.2 micron water filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 11:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 11:55

Constructed Depth to Well Bottom (ft) ~~35~~ 37.2 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~24.00 - 34.00~~ 27.2-37.2 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 11:30

Location ID: 16WW23 Sample No: 16WW23-181012										
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
10/12/2018	11:30	300	1.500	9.23	7.075	19.30	5.25	82.1	261.7	5.64
10/12/2018	11:35	200	2.500	9.54	7.674	19.02	5.44	155.9	90.7	3.03
10/12/2018	11:40	200	3.500	9.59	7.635	19.06	5.46	160.6	64.6	2.20
10/12/2018	11:45	200	4.500	9.62	7.560	19.15	5.47	180.1	45.2	1.67
10/12/2018	11:50	200	5.500	9.63	7.608	19.16	5.48	200.5	28.7	1.38
10/12/2018	11:55	200	6.500	9.64	7.916	19.18	5.49	183.8	13.2	1.23

01028785

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW24**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:78, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW24-181009**

DATE/TIME: 10/9/2018 / 14:45

Pump Inlet Depth (ft): 13.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: 16WW24-181009-FD + MS/MSD Perchlorate field filtered w/ 0.2 micron filter. Gauged depth to water twice 10.17FT / 10.17FT.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 14:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:45

Constructed Depth to Well Bottom (ft) ~~17~~ 19.29 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~11.00 - 16.00~~ 14.29-19.29 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:10

Sample Collection Log

01028786

Location ID: 16WW24 Sample No: 16WW24-181009										
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
10/9/2018	14:15	100	1.0	10.65	2.501	23.34	3.75	2.1	257.2	0.77
10/9/2018	14:20	100	1.5	10.95	2.486	23.31	3.59	0.2	269.8	0.51
10/9/2018	14:25	100	2.0	11.05	2.573	23.33	3.61	1.9	264.7	0.57
10/9/2018	14:30	100	2.5	11.10	2.541	23.41	3.57	0.0	275.1	0.43
10/9/2018	14:35	100	3.0	11.10	2.532	23.45	3.56	0.0	278.3	0.42
10/9/2018	14:40	100	3.5	11.10	2.538	23.46	3.54	0.0	280.1	0.19
10/9/2018	14:45	100	4.0	11.10	2.542	23.49	3.54	0.0	282.6	0.17

01028787

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW24**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:78, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW24-181009-FD**

DATE/TIME: 10/9/2018 / 14:45

Pump Inlet Depth (ft): 13.5

Sampling Method: Peristaltic Pump

Sample Purpose: FD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	[redacted]		
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 14:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:45

Constructed Depth to Well Bottom (ft) ~~17~~ 19.29 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~11.00 - 16.00~~ 14.29-19.29 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:10

Location ID: 16WW24 Sample No: 16WW24-181009-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

01028788

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW24**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:78, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW24-181009MS**

DATE/TIME: 10/9/2018 / 14:45

Pump Inlet Depth (ft): 13.5

Sampling Method: Peristaltic Pump

Sample Purpose: MS

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	[redacted]		
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 14:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:45

Constructed Depth to Well Bottom (ft) ~~17~~ 19.29 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~11.00 - 16.00~~ 14.29-19.29 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:10

Location ID: 16WW24 Sample No: 16WW24-181009MS										
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

01028789

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW24**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:78, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW24-181009MSD**

DATE/TIME: 10/9/2018 / 14:45

Pump Inlet Depth (ft): 13.5

Sampling Method: Peristaltic Pump

Sample Purpose: MSD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	[redacted]		
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 14:10

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:45

Constructed Depth to Well Bottom (ft) ~~17~~ 19.29 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~11.00 - 16.00~~ 14.29-19.29 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:10

Location ID: 16WW24 Sample No: 16WW24-181009MSD										
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

01028790

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW25**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Light Rain, Air Temp:86, Wind Speed:Strong Winds

SAMPLING INFORMATION

Sample No: **16WW25-181009**

DATE/TIME: 10/9/2018 / 13:12

Pump Inlet Depth (ft): 44

Sampling Method: Low Flow

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 19.28' / 19.28'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 12:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 13:12

Constructed Depth to Well Bottom (ft) ~~50~~ 52.25 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 42.25-52.25 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 12:30

Location ID: 16WW25 Sample No: 16WW25-181009										
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
10/9/2018	12:47	100	1.0	19.43	5.270	22.74	5.13	25.5	94.3	0.96
10/9/2018	12:52	100	1.5	19.48	6.853	21.89	5.51	51.5	40.2	0.78
10/9/2018	12:57	100	2.0	19.51	8.510	21.28	5.94	69.1	-7.4	0.51
10/9/2018	13:02	100	2.5	19.55	8.453	21.88	5.95	78.1	-10.1	0.66
10/9/2018	13:07	100	3.0	19.61	8.462	21.85	5.95	72.5	-11.0	0.57
10/9/2018	13:12	100	4.0	19.67	8.457	21.80	5.95	30.7	-13.4	0.31

01028791

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW26**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Partly Cloudy, Air Temp:82, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW26-181009**

DATE/TIME: 10/9/2018 / 11:18

Pump Inlet Depth (ft): 15

Sampling Method: Low Flow

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Guaged well twice and the water level was 18.39. Perchlorate field filtered w 0.2 micron filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 10:45

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 11:18

Constructed Depth to Well Bottom (ft) ~~18.5~~ 20.97 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~12.50 - 17.50~~ 15.97-20.97 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 10:45

Location ID: 16WW26 Sample No: 16WW26-181009										
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
10/9/2018	10:50	100	1.0	18.54	2.297	20.79	5.14	59.5	155.5	1.70
10/9/2018	10:58	100	1.5	18.82	2.293	21.17	4.88	24.0	170.3	0.70
10/9/2018	11:03	100	2.0	18.94	2.289	21.17	4.87	19.4	174.6	0.68
10/9/2018	11:08	100	2.5	19.03	2.273	21.16	4.90	13.3	161.4	0.69
10/9/2018	11:13	100	3.0	19.28	2.259	21.25	5.09	9.9	71.9	0.73
10/9/2018	11:18	100	3.5	19.39	2.277	21.06	5.08	5.8	50.4	0.66

01028792

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW27**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:74, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW27-181012

DATE/TIME: 10/12/2018 / 13:10

Pump Inlet Depth (ft): 31

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 8.91, Second Gauge: 8.91. Perchlorate sample field filtered with 0.2 micron groundwater filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 12:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 13:10

Constructed Depth to Well Bottom (ft) ~~50~~ 39.1 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~26.00 - 36.00~~ 29.1-39.1 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 12:30

APTIM

Sample Collection Log

01028793

Location ID: 16WW27 Sample No: 16WW27-181012										
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
10/12/2018	12:30	300	1.500	8.91	2.540	20.11	4.32	71.5	235.2	5.31
10/12/2018	12:35	200	2.500	9.16	8.324	19.72	5.28	101.5	136.9	3.76
10/12/2018	12:40	200	3.500	9.22	8.427	19.74	5.43	132.9	57.3	2.59
10/12/2018	12:45	200	4.500	9.26	8.452	19.77	5.47	146.2	277	1.87
10/12/2018	12:50	200	5.500	9.28	8.469	19.69	5.48	155.7	9.3	1.51
10/12/2018	12:55	200	6.500	9.29	8.467	19.62	5.49	157.3	0.8	1.30
10/12/2018	13:00	200	7.500	9.31	8.474	19.59	5.50	176.5	-4.7	1.16
10/12/2018	13:05	200	8.500	9.31	8.491	19.59	5.50	185.1	-8.0	1.06
10/12/2018	13:10	200	9.500	9.32	8.499	19.61	5.54	186.5	-11.4	0.98

01028794

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW29**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:65, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW29-181015**

DATE/TIME: 10/15/2018 / 10:05

Pump Inlet Depth (ft): 39.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice, 8.73' / 8.73'. Perchlorate field filtered w/ 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181015-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/15/2018 / 09:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/15/2018 / 10:05

Constructed Depth to Well Bottom (ft) ~~43~~ 45.08 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~37.00 - 42.00~~ 40.08-45.08 FT BTOC
L George 05/21/2020

Pump Start Time: 10/15/2018 / 09:30

APTIM

Sample Collection Log

01028795

Location ID: 16WW29 Sample No: 16WW29-181015										
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
10/15/2018	09:35	160	1.0	8.83	0.608	18.32	5.19	0.0	78.7	1.57
10/15/2018	09:40	160	1.8	8.83	0.571	18.36	5.68	0.0	38.9	1.41
10/15/2018	09:45	160	2.6	8.83	0.550	18.41	5.98	0.0	29.4	1.27
10/15/2018	09:50	160	3.4	8.83	0.535	18.38	6.10	0.0	27.2	1.25
10/15/2018	09:55	160	4.2	8.83	0.523	18.37	6.15	0.0	25.8	1.17
10/15/2018	10:00	160	5.0	8.83	0.522	18.39	6.18	0.0	25.4	1.16
10/15/2018	10:05	160	5.8	8.83	0.522	18.39	6.19	0.0	25.1	1.16

01028796

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW29**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: **16WW29-181015MS**

DATE/TIME: 10/15/2018 / 09:30

Pump Inlet Depth (ft): 39.5

Sampling Method:

Sample Purpose: MS

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment:

Casing ID (in.): 4

Purge Start Date/Time: - / -

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/15/2018 / 09:30

Constructed Depth to Well Bottom (ft) ~~43~~ 45.08 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~37.00 - 42.00~~ 40.08-45.08 FT BTOC
L George 05/21/2020

Pump Start Time:

Location ID: 16WW29 Sample No: 16WW29-181015MS										
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

01028797

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW30**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Clear, Air Temp:65, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW30-181012**

DATE/TIME: 10/12/2018 / 10:30

Pump Inlet Depth (ft): 27.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 9.27, second gauge: 9.27. Perchlorate Sample field filtered with 0.2 micron water filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 09:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 10:30

Constructed Depth to Well Bottom (ft) ~~31~~ 33.14 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~25.00 - 30.00~~ 28.14-33.14 FT BTOC

L George 05/21/2020

Pump Start Time: 10/12/2018 / 09:30

APTIM

Sample Collection Log

01028798

Location ID: 16WW30 Sample No: 16WW30-181012										
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
10/12/2018	09:30	125	.625	9.27	2.957	19.02	6.16	92.4	136.0	4.76
10/12/2018	09:35	200	1.625	9.46	2.954	19.09	5.99	143.5	94.0	2.73
10/12/2018	09:40	200	2.625	9.50	2.932	19.12	5.97	137.0	87.2	2.11
10/12/2018	09:45	200	3.625	9.53	2.926	19.25	5.96	155.2	75.7	1.66
10/12/2018	09:50	200	4.625	9.55	3.216	19.28	5.93	170.2	67.5	1.44
10/12/2018	~~19:55~~ 09:55	200	5.625	9.56	3.881	19.27	5.83	177.1	50.1	1.30
10/12/2018	10:05	200	7.625	9.56	5.020	19.32	5.74	117.0	18.8	1.12
10/12/2018	10:15	200	9.625	9.60	5.272	19.31	5.85	205.4	-23.8	1.00
10/12/2018	10:25	200	11.625	9.62	5.307	19.28	5.86	197.3	-34.7	0.92
10/12/2018	10:30	200	12.625	9.62	5.319	19.34	5.86	212.0	-39.1	0.87

Time corrected - GNJ

01028799

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW31**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW31-181010

DATE/TIME: 10/10/2018 / 14:30

Pump Inlet Depth (ft): 44

Sampling Method: Bladder Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: 16WW31-181010-FD + MS/MSD. Gauged DTW twice, 31.45FT / 31.45FT. Perchlorate field filtered w/ 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 13:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 14:30

Constructed Depth to Well Bottom (ft) ~~50~~ 51.78 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 41.78-51.78 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 13:50

APTIM

Sample Collection Log

01028800

Location ID: 16WW31 Sample No: 16WW31-181010										
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
10/10/2018	13:55	200	1.0	31.55	1.391	21.00	5.65	101.1	179.3	1.72
10/10/2018	14:00	200	2.0	31.55	1.369	21.29	5.64	99.3	181.1	1.39
10/10/2018	14:05	200	3.0	31.55	1.392	21.64	5.62	89.0	187.5	1.13
10/10/2018	14:10	200	4.0	31.55	1.396	21.99	5.45	66.1	201.0	0.89
10/10/2018	14:15	200	5.0	31.55	1.401	22.16	5.41	62.5	205.1	0.77
10/10/2018	14:20	200	6.0	31.55	1.404	22.26	5.37	57.2	209.0	0.75
10/10/2018	14:25	200	7.0	31.55	1.405	22.29	5.32	56.4	215.7	0.72
10/10/2018	14:30	200	8.0	31.55	1.417	22.25	5.32	55.9	219.1	0.71

01028801

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW31**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW31-181010-FD

DATE/TIME: 10/10/2018 / 14:30

Pump Inlet Depth (ft): 44

Sampling Method: Bladder Pump

Sample Purpose: FD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: - / -

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 14:30

Constructed Depth to Well Bottom (ft) ~~50~~ 51.78 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 41.78-51.78 FT BTOC
L George 05/21/2020

Pump Start Time:

Location ID: 16WW31 Sample No: 16WW31-181010-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

01028802

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW31**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW31-181010MS

DATE/TIME: 10/10/2018 / 14:30

Pump Inlet Depth (ft): 44

Sampling Method: Bladder Pump

Sample Purpose: MS

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: - / -

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 14:30

Constructed Depth to Well Bottom (ft) ~~50~~ 51.78 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 41.78-51.78 FT BTOC
L George 05/21/2020

Pump Start Time:

Location ID: 16WW31 Sample No: 16WW31-181010MS

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

01028803

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW31**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW31-181010MSD

DATE/TIME: 10/10/2018 / 14:30

Pump Inlet Depth (ft): 44

Sampling Method: Bladder Pump

Sample Purpose: MSD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: - / -

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 14:30

Constructed Depth to Well Bottom (ft) ~~50~~ 51.78 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 41.78-51.78 FT BTOC
L George 05/21/2020

Pump Start Time:

Location ID: 16WW31 Sample No: 16WW31-181010MSD

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

01028804

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW32**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:70, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW32-181011

DATE/TIME: 10/11/2018 / 09:28

Pump Inlet Depth (ft): 27

Sampling Method: Bladder Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 31.58' / 31.58'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181011-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/11/2018 / 08:55

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/11/2018 / 09:28

Constructed Depth to Well Bottom (ft) ~~33~~ 35.01 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~22.00 - 32.00~~ 25.01-35.01 FT BTOC
L George 05/21/2020

Pump Start Time: 10/11/2018 / 08:55

Location ID: 16WW32 Sample No: 16WW32-181011										
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
10/11/2018	09:01	125	1.0	31.82	1.187	17.84	6.75	108.3	85.3	3.02
10/23/2018	09:08	300	3.5	31.93	1.173	18.18	5.96	72.1	90.6	3.11
10/23/2018	09:13	125	4.125	32.03	1.170	18.20	5.82	42.1	101.7	2.86
10/23/2018	09:18	125	4.75	32.12	1.170	18.26	5.76	36.4	106.6	2.82
10/23/2018	09:23	125	5.375	32.13	1.172	18.29	5.71	32.0	110.4	2.54
10/23/2018	09:28	125	6.0	32.24	1.171	18.30	5.64	25.9	115.4	1.94

01028805

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW33**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW33-181010**

DATE/TIME: 10/10/2018 / 10:20

Pump Inlet Depth (ft): 44

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice, 31.39' / 31.39'. Perchlorate field filtered w/ 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 09:45

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 10:20

Constructed Depth to Well Bottom (ft) ~~50~~ 52.17 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~39.00 - 49.00~~ 42.17-52.17 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 09:45

APTIM

Sample Collection Log

01028806

Location ID: 16WW33 Sample No: 16WW33-181010										
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
10/10/2018	09:50	100	1.0	31.60	1.994	20.41	6.47	24.3	125.0	1.34
10/10/2018	09:55	100	1.5	31.70	2.009	20.40	6.42	21.1	129.3	1.42
10/10/2018	10:00	100	2.0	31.75	2.065	20.38	6.41	20.3	131.8	1.50
10/10/2018	10:05	100	2.5	31.75	2.111	20.39	6.43	50.1	132.3	1.48
10/10/2018	10:10	100	3.0	31.75	2.123	20.40	6.44	49.3	133.4	1.42
10/10/2018	10:15	100	3.5	31.75	2.189	20.38	6.48	48.5	131.2	1.40
10/10/2018	10:20	100	4.0	31.75	2.174	20.40	6.49	49.2	132.3	1.39

01028807

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW34**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW34-181010**

DATE/TIME: 10/10/2018 / 13:05

Pump Inlet Depth (ft): 29.5

Sampling Method: Bladder Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Perchlorate field filtered w/ 0.2 micron filter. Gauged depth to water twice 31.35' / 31.35'

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 12:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 13:05

Constructed Depth to Well Bottom (ft) ~~32.5~~ 34.81 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~27.00 - 32.00~~ 29.81-34.81 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 12:30

APTIM

Sample Collection Log

01028808

Location ID: 16WW34 Sample No: 16WW34-181010										
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
10/10/2018	12:35	100	1.0	31.60	1.201	20.22	6.09	123.7	10.1	1.04
10/10/2018	12:40	100	1.5	31.70	1.244	20.19	6.10	113.1	14.3	0.86
10/10/2018	12:45	100	2.0	31.74	1.287	20.41	6.13	109.6	13.5	0.88
10/10/2018	12:50	100	2.5	31.76	1.306	20.59	6.15	86.9	12.7	0.96
10/10/2018	12:55	100	3.0	31.81	1.308	20.60	6.17	84.8	12.1	0.94
10/10/2018	13:00	100	3.5	31.82	1.308	20.62	6.17	84.7	13.0	0.92
10/10/2018	13:05	100	4.0	31.82	1.305	20.63	6.15	84.1	13.2	0.92

01028809

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW35**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:74, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW35-181010**

DATE/TIME: 10/10/2018 / 13:11

Pump Inlet Depth (ft): 38.5

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 19.48' / 19.48'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 12:40

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 13:11

Constructed Depth to Well Bottom (ft) ~~44~~ 46.58 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~33.50 - 43.50~~ 36.58-46.58 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 12:40

Location ID: 16WW35 Sample No: 16WW35-181010										
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
10/10/2018	12:48	125	1.0	19.88	13.66	21.26	6.25	21.4	170.1	1.67
10/10/2018	12:53	125	1.625	19.94	13.44	21.11	6.16	12.8	166.7	1.15
10/10/2018	12:58	125	2.25	20.15	13.76	21.11	6.16	16.3	161.8	0.66
10/10/2018	13:03	125	2.875	20.29	13.56	21.16	6.17	17.6	161.0	0.55
10/10/2018	13:08	125	3.5	20.29	13.53	21.18	6.17	5.4	159.8	0.41
10/10/2018	13:11	125	4.125	20.29	13.52	21.27	6.17	5.1	158.6	0.42

01028810

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW36**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Light Rain, Air Temp:84, Wind Speed:Strong Winds

SAMPLING INFORMATION

Sample No: 16WW36-181009

DATE/TIME: 10/9/2018 / 14:53

Pump Inlet Depth (ft): 19

Sampling Method: Low Flow

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice with water level at 18.88. Perchlorate sample field filtered w 0.2 mircon filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 14:20

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 14:53

Constructed Depth to Well Bottom (ft) ~~22~~ 24.49 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~16.50 - 21.50~~ 19.49-24.49 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 14:20

Location ID: 16WW36 Sample No: 16WW36-181009										
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
10/9/2018	14:28	100	1.0	19.12	11.01	21.56	6.03	24.9	70.0	0.93
10/9/2018	14:33	100	1.5	19.16	11.00	21.80	6.04	18.2	90.5	0.54
10/9/2018	14:38	100	2.0	19.22	11.03	22.14	6.06	9.8	94.1	0.43
10/9/2018	14:43	100	2.5	19.27	11.11	22.22	6.06	5.7	105.8	0.46
10/9/2018	14:48	100	3.0	19.33	11.14	22.21	6.06	3.5	106.5	0.36
10/9/2018	14:53	100	3.5	19.41	11.03	22.32	6.07	1.8	116.1	0.39

01028811

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW37**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:74, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW37-181010**

DATE/TIME: 10/10/2018 / 10:39

Pump Inlet Depth (ft): 43

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 29.28' / 29.28'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 10:05

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 10:39

Constructed Depth to Well Bottom (ft) ~~46~~ 48.72 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~40.50 - 45.50~~ 43.72-48.72 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 10:05

Location ID: 16WW37 Sample No: 16WW37-181010										
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
10/10/2018	10:14	100	1.0	29.72	4.610	21.40	6.59	37.9	12.3	1.39
10/10/2018	10:19	100	1.5	29.78	4.601	21.23	6.64	38.5	11.9	1.00
10/10/2018	10:24	100	2.0	29.98	4.583	21.16	6.66	36.2	24.2	0.70
10/10/2018	10:29	100	2.5	30.09	4.577	21.30	6.69	33.2	31.8	0.62
10/10/2018	10:34	100	3.0	30.20	4.579	21.78	6.71	40.6	43.0	0.57
10/10/2018	10:39	100	3.5	30.29	4.617	21.51	6.73	43.2	48.3	0.57

01028812

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW38**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW38-181010**

DATE/TIME: 10/10/2018 / 09:40

Pump Inlet Depth (ft): 24

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 29.18' / 29.18'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 09:16

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 09:40

Constructed Depth to Well Bottom (ft) ~~30~~ 32.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~19.00 - 29.00~~ 22.3-32.3 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 09:16

Location ID: 16WW38 Sample No: 16WW38-181010

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
10/10/2018	09:24	100	1.0	29.47	2.637	20.73	5.93	17.1	-24.8	1.02
10/10/2018	09:29	100	1.5	29.68	2.557	20.84	5.97	15.6	-32.3	0.74
10/10/2018	09:34	100	2.0	29.48	2.528	21.00	5.97	30.7	-36.8	0.63
10/10/2018	09:39	100	2.5	29.48	2.551	21.01	5.95	22.4	-40.2	0.52
10/10/2018	09:44	100	3.0	29.49	2.606	21.01	5.95	23.1	-44.3	0.44
10/10/2018	09:49	100	3.5	29.48	2.604	20.99	5.94	24.4	-44.9	0.38

01028813

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW39**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW39-181010**

DATE/TIME: 10/10/2018 / 15:39

Pump Inlet Depth (ft): 99

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice for water level 21.66' / 21.66'. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 2

Purge Start Date/Time: 10/10/2018 / 14:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 15:39

Constructed Depth to Well Bottom (ft) ~~26.5~~ 29.5 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~99.00 - 99.00~~ 18-28 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 14:50

Location ID: 16WW39 Sample No: 16WW39-181010										
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
10/10/2018	15:14	125	1.0	22.02	6.806	20.75	5.91	18.4	123.4	0.67
10/10/2018	15:19	125	1.625	22.02	6.438	20.74	5.77	35.3	130.1	0.48
10/10/2018	15:24	125	2.25	22.02	6.186	20.73	5.74	53.4	128.6	0.44
10/10/2018	15:29	125	2.875	22.02	5.919	20.57	5.74	11.1	122.8	0.48
10/10/2018	15:34	125	3.5	22.04	5.839	20.49	5.74	13.7	119.4	0.41
10/10/2018	15:39	125	4.125	22.04	5.745	20.60	5.74	15.7	115.9	0.48

01028814

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW40**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW40-181012**

DATE/TIME: 10/12/2018 / 12:35

Pump Inlet Depth (ft): 99

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: 16WW40-181012-FD + MS/MSD Perchlorate field filtered w/ 0.2 micron filter. Gauged depth to water twice 12.31FT / 12.31FT.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 2

Purge Start Date/Time: 10/12/2018 / 11:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 12:35

Constructed Depth to Well Bottom (ft) ~~18.5~~ 21.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~-99.00 - -99.00~~ 10.8-20.8 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 11:50

APTIM

Sample Collection Log

01028815

Location ID: 16WW40 Sample No: 16WW40-181012										
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
10/12/2018	11:55	150	1.0	12.56	7.009	20.61	6.12	9.2	-22.4	0.95
10/12/2018	12:00	150	1.75	12.56	7.318	20.88	3.01	8.3	-54.3	0.51
10/12/2018	12:05	150	2.50	12.56	7.440	20.93	5.91	7.0	-62.5	0.40
10/12/2018	12:10	150	3.25	12.56	7.439	20.99	6.02	2.4	-74.1	0.51
10/12/2018	12:15	150	4.00	12.56	7.387	21.04	5.92	0.0	-60.8	0.49
10/12/2018	12:20	150	4.75	12.56	7.240	21.11	5.92	0.0	-55.5	0.45
10/12/2018	12:25	150	5.50	12.56	7.042	21.24	5.90	0.0	-49.2	0.33
10/12/2018	12:30	150	6.25	12.56	7.031	21.24	5.90	0.0	-46.3	0.32
10/12/2018	12:35	150	7.00	12.56	7.029	21.27	5.90	0.0	-44.1	0.30

01028816

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW40**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW40-181012-FD

DATE/TIME: 10/12/2018 / 12:35

Pump Inlet Depth (ft): 99

Sampling Method: Peristaltic Pump

Sample Purpose: FD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:	[redacted]		
QC'ed By:	[redacted]		

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 2

Purge Start Date/Time: 10/12/2018 / 11:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 12:35

Constructed Depth to Well Bottom (ft) ~~18.5~~ 21.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~-99.00 - -99.00~~ 10.8-20.8 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 11:50

Location ID: 16WW40 Sample No: 16WW40-181012-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

01028817

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW40**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW40-181012MS**

DATE/TIME: 10/12/2018 / 12:35

Pump Inlet Depth (ft): 99

Sampling Method: Peristaltic Pump

Sample Purpose: MS

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 2

Purge Start Date/Time: 10/12/2018 / 11:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 12:35

Constructed Depth to Well Bottom (ft) ~~18.5~~ 21.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~-99.00 - -99.00~~ 10.8-20.8 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 11:50

Location ID: 16WW40 Sample No: 16WW40-181012MS										
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

01028818

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW40**

Project No: **501032**

Sampler(s):

FIELD CONDITIONS

Cloudy, Air Temp:75, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW40-181012MSD**

DATE/TIME: 10/12/2018 / 12:35

Pump Inlet Depth (ft): 99

Sampling Method: Peristaltic Pump

Sample Purpose: MSD

Sample Matrix: GW

Sample Notes:

Chain of Custody	COC Notes	Analysis Group	Analytic Method
No COC Specified	None		

Sampler:			
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 2

Purge Start Date/Time: 10/12/2018 / 11:50

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 12:35

Constructed Depth to Well Bottom (ft) ~~18.5~~ 21.3 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~-99.00 - -99.00~~ 10.8-20.8 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 11:50

Location ID: 16WW40 Sample No: 16WW40-181012MSD										
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

01028819

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW41**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW41-181009**

DATE/TIME: 10/9/2018 / 11:25

Pump Inlet Depth (ft): 45

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 27.76. Second Gauge: 27.76. Perchlorate sample field filtered with 0.2 micron water filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 10:45

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 11:25

Constructed Depth to Well Bottom (ft) ~~51~~ 53.6 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~40.00 - 50.00~~ 42.6-52.6 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 10:45

APTIM

Sample Collection Log

01028820

Location ID: 16WW41 Sample No: 16WW41-181009										
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
10/9/2018	10:45	125	.625	27.76	14.29	21.34	6.22	-287.2	272.1	3.08
10/9/2018	10:50	125	1.250	27.85	14.52	21.32	6.23	123.3	271.8	2.07
10/9/2018	10:55	100	1.750	27.94	14.55	21.47	6.22	129.2	271.4	1.27
10/9/2018	11:00	100	2.250	27.99	14.56	21.59	6.21	112.9	270.9	1.09
10/9/2018	11:05	100	2.750	28.09	14.57	21.68	6.21	129.3	269.9	0.96
10/9/2018	11:10	100	3.250	28.13	14.55	21.82	6.21	80.1	268.9	0.87
10/9/2018	11:15	100	3.725	28.18	14.58	21.92	6.21	97.7	267.9	0.81
10/9/2018	11:20	100	4.250	28.22	14.58	22.01	6.21	81.5	266.7	0.77
10/9/2018	11:25	100	4.725	28.24	14.58	22.04	6.21	86.2	266.0	0.79

01028821

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW42**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:70, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW42-181012**

DATE/TIME: 10/12/2018 / 14:25

Pump Inlet Depth (ft): 7

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 10.95, second gauge: 10.95. Perchlorate sample field filtered with 0.2 micron groundwater filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 13:55

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 14:25

Constructed Depth to Well Bottom (ft) ~~12~~ 16.57 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~2.00 - 12.00~~ 6.57-16.57 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 13:55

APTIM

Sample Collection Log

01028822

Location ID: 16WW42 Sample No: 16WW42-181012										
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
10/12/2018	13:55	300	1.500	10.95	2.884	21.18	5.40	170.1	212.8	4.92
10/12/2018	14:00	200	2.500	11.45	2.217	21.29	5.47	191.7	154.3	3.22
10/12/2018	14:05	150	3.250	11.64	1.851	21.35	5.47	204.5	128.8	2.17
10/12/2018	14:10	125	3.825	11.80	1.504	21.43	5.42	209.0	117.5	1.62
10/12/2018	14:15	100	4.325	11.95	1.225	21.48	5.32	208.7	118.6	1.37
10/12/2018	14:20	100	4.825	12.09	1.039	21.47	5.26	209.0	116.5	1.26
10/12/2018	14:25	100	5.325	12.24	0.984	21.50	5.27	209.3	113.6	1.21

01028823

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW43**

Project No: **501032**

Sampler(s): **Kevin Schmitt**

FIELD CONDITIONS

Mostly Cloudy, Air Temp:82, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW43-181009

DATE/TIME: 10/9/2018 / 09:49

Pump Inlet Depth (ft): 7

Sampling Method: Low Flow

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged well twice with water level at 10.38. Perchlorate field filtered w 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181009-01	None	PERCHLORATE	6850

Sampler:		Kevin Schmitt	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/9/2018 / 09:20

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/9/2018 / 09:49

Constructed Depth to Well Bottom (ft) ~~12~~ 14.59 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~2.00 - 12.00~~ 4.59-14.59 FT BTOC
L George 05/21/2020

Pump Start Time: 10/9/2018 / 09:20

Location ID: 16WW43 Sample No: 16WW43-181009										
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
10/9/2018	09:24	100	1.0	10.79	0.323	21.76	6.14	14.5	6.1	1.11
10/9/2018	09:29	100	1.5	10.91	0.314	21.91	6.13	22.3	0.1	0.96
10/9/2018	09:34	100	2.0	11.07	0.311	21.89	6.13	22.0	9.9	0.86
10/9/2018	09:39	100	2.5	11.18	0.299	21.90	6.09	24.5	18.9	0.75
10/9/2018	09:44	100	3.0	11.28	0.298	21.88	6.09	21.2	-0.2	1.09
10/9/2018	09:49	100	3.5	11.37	~~.0300~~ 0.300	21.93	6.12	20.6	-1.7	1.46

Cond. corrected - GNJ

01028824

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW44**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:70, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW44-181010

DATE/TIME: 10/10/2018 / 10:05

Pump Inlet Depth (ft): 25

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 25.80; Second Gauge 25.80. Perchlorate sample field screened with 0.2 micron groundwater filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 09:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 10:05

Constructed Depth to Well Bottom (ft) ~~30~~ 32.18 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~20.00 - 30.00~~ 22.18-32.18 FT BTOC

L George 05/21/2020

Pump Start Time: 10/10/2018 / 09:30

APTIM

Sample Collection Log

01028825

Location ID: 16WW44 Sample No: 16WW44-181010										
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
10/10/2018	09:30	250	1.250	26.10	0.460	20.18	5.58	133.3	161.0	4.42
10/10/2018	09:35	200	2.250	26.18	0.429	20.07	5.74	89.5	129.0	3.58
10/10/2018	09:40	175	3.125	26.30	0.402	20.10	5.90	134.8	88.1	2.62
10/10/2018	09:45	175	4.00	26.37	0.394	20.06	5.94	138.4	79.8	2.30
10/10/2018	09:50	175	4.875	26.48	0.386	20.15	5.96	138.5	69.3	2.07
10/10/2018	09:55	150	5.625	26.58	0.382	20.37	5.98	139.0	62.8	1.94
10/10/2018	10:00	150	6.375	26.65	0.380	20.66	6.00	139.6	57.7	1.89
10/10/2018	10:05	150	7.125	26.76	0.381	20.51	5.99	139.3	53.5	1.80

01028826

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW45**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:72, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW45-181010

DATE/TIME: 10/10/2018 / 11:10

Pump Inlet Depth (ft): 45

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gauge: 25.81. Second Gauge: 25.81. Perchlorate sample field filtered with 0.2 micron water filter

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181010-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/10/2018 / 10:25

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/10/2018 / 11:10

Constructed Depth to Well Bottom (ft) ~~51~~ 53.63 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~40.00 - 50.00~~ 42.63-52.63 FT BTOC
L George 05/21/2020

Pump Start Time: 10/10/2018 / 10:25

APTIM

Sample Collection Log

01028827

Location ID: 16WW45 Sample No: 16WW45-181010										
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
10/10/2018	10:25	150	.750	25.81	0.420	21.77	6.33	143.2	308.1	6.00
10/10/2018	10:30	150	1.500	26.16	0.756	20.72	6.71	142.1	259.1	5.14
10/10/2018	10:35	150	2.250	26.28	0.746	20.60	6.77	142.8	250.1	4.44
10/10/2018	10:40	100	3.250	26.47	0.852	20.51	6.83	142.9	96.8	3.00
10/10/2018	10:50	100	4.250	26.62	0.897	20.68	6.94	143.4	-8.6	1.55
10/10/2018	11:00	100	5.250	26.69	0.906	20.81	6.95	143.4	-30.3	1.29
10/10/2018	11:05	100	5.750	26.72	0.902	21.03	7.04	143.9	-35.0	1.19
10/10/2018	11:10	100	6.250	26.73	0.897	21.04	7.05	144.1	-25.0	1.25

01028828

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW46**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:70, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW46-181012**

DATE/TIME: 10/12/2018 / 11:05

Pump Inlet Depth (ft): 15

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Perchlorate field filtered w/ 0.2 micron filter. Gauged depth to water twice 15.83' / 15.83'

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181012-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/12/2018 / 10:30

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/12/2018 / 11:05

Constructed Depth to Well Bottom (ft) ~~21~~ 23.29 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~10.00 - 20.00~~ 12.29-22.29 FT BTOC
L George 05/21/2020

Pump Start Time: 10/12/2018 / 10:30

APTIM

Sample Collection Log

01028829

Location ID: 16WW46 Sample No: 16WW46-181012										
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
10/12/2018	10:35	140	1.0	16.00	2.975	18.74	6.20	20.0	35.2	0.93
10/12/2018	10:40	140	1.7	16.09	2.841	18.75	6.05	19.8	38.3	0.72
10/12/2018	10:45	140	2.4	16.09	2.815	18.76	5.99	19.6	41.7	0.47
10/12/2018	10:50	140	3.1	16.09	2.900	18.80	6.18	19.1	42.3	0.47
10/12/2018	10:55	140	3.8	16.09	2.908	18.82	6.21	18.3	43.2	0.48
10/12/2018	11:00	140	4.5	16.09	2.912	18.81	6.24	17.5	43.8	0.49
10/12/2018	11:05	140	5.2	16.09	2.912	18.84	6.24	18.2	43.9	0.49

01028830

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW48**

Project No: **501032**

Sampler(s): **Mike Martinez**

FIELD CONDITIONS

Cloudy, Air Temp:68, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: **16WW48-181018**

DATE/TIME: 10/18/2018 / 12:40

Pump Inlet Depth (ft): 15

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: Gauged DTW twice, 11.87' / 11.87'. Perchlorate field filtered w/ 0.2 micron filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181016-01	None	PERCHLORATE	6850

Sampler:		Mike Martinez	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow

Casing ID (in.): 4

Purge Start Date/Time: 10/18/2018 / 12:00

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/18/2018 / 12:40

Constructed Depth to Well Bottom (ft) 22.95 FT BTOC

L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~10.00 - 20.00~~ 12.95-22.95 FT BTOC

L George 05/21/2020

Pump Start Time: 10/18/2018 / 12:00

APTIM

Sample Collection Log

01028831

Location ID: 16WW48 Sample No: 16WW48-181018										
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
10/18/2018	12:05	160	1.0	11.95	6.565	19.53	5.72	0.0	181.5	1.51
10/18/2018	12:10	160	1.8	11.95	6.730	19.50	5.92	0.0	166.4	1.32
10/18/2018	12:15	160	2.6	11.95	6.729	19.50	5.73	0.0	177.4	1.44
10/18/2018	12:20	160	3.4	11.95	6.745	19.68	5.73	0.0	176.4	1.30
10/18/2018	12:25	160	4.2	11.95	6.753	19.72	5.74	0.0	175.3	1.05
10/18/2018	12:30	160	5.0	11.95	6.776	19.77	5.78	0.0	176.0	0.99
10/18/2018	12:35	160	5.8	11.95	6.772	19.79	5.73	0.0	179.1	0.97
10/18/2018	12:40	160	6.6	11.95	6.771	19.79	5.75	0.0	173.1	0.98

01028832

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW55**

Project No: **501032**

Sampler(s): **Lindsey Luetge**

FIELD CONDITIONS

Cloudy, Air Temp:65, Wind Speed:Slight Winds

SAMPLING INFORMATION

Sample No: 16WW55-181015

DATE/TIME: 10/15/2018 / 10:30

Pump Inlet Depth (ft): 22

Sampling Method: Peristaltic Pump

Sample Purpose: REG

Sample Matrix: GW

Sample Notes: First gague: 22.88, Second Gauge: 22.88. Perchlorate sample field filtered with 0.2 micron groundwater filter.

Chain of Custody	COC Notes	Analysis Group	Analytic Method
LHAAP16-OCT2018-GW-ALSHT-181015-01	None	PERCHLORATE	6850

Sampler:	Lindsey Luetge	Lindsey Luetge	
QC'ed By:			

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Peristaltic Pump

Casing ID (in.): 4

Purge Start Date/Time: 10/15/2018 / 09:40

Depth to Water - Initial (DTWi) (ft)

Purge End Date/Time: 10/15/2018 / 10:30

Constructed Depth to Well Bottom (ft) ~~27.5~~ 30.42 FT BTOC
L George 05/26/2020

PID Reading: N/A

Measured Depth of Well (ft): N/A

Screen Interval (ft): ~~17.00 - 27.00~~ 19.92-29.92 FT BTOC
L George 05/21/2020

Pump Start Time: 10/15/2018 / 09:40

APTIM

Sample Collection Log

01028833

Location ID: 16WW55 Sample No: 16WW55-181015										
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
10/15/2018	09:40	100	.500	22.88	2.893	18.88	7.04	2.7	331.7	7.32
10/15/2018	09:45	150	1.250	22.95	6.160	19.00	6.30	10.9	342.0	5.43
10/15/2018	09:50	200	2.250	22.97	6.162	19.02	6.24	55.2	340.8	4.44
10/15/2018	10:00	100	3.250	22.99	6.155	19.09	6.21	6.1	336.8	3.37
10/15/2018	10:10	100	4.250	23.00	6.147	19.11	6.18	-8.5	319.2	2.70
10/15/2018	10:20	200	6.250	23.00	6.136	19.17	6.18	1.2	320.7	2.28
10/15/2018	10:25	200	8.250	23.00	6.136	19.12	6.19	-8.6	320.4	2.18
10/15/2018	10:30	200	9.250	23.01	6.130	19.10	6.19	-8.6	319.9	2.08

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW02**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16EW02-190918

DATE/TIME: 9/18/19 / 1455

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16 LFAAP-TB3 190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 6

Purge Start Date/Time: 9/18/19/1425

Depth to Water - Initial (DTWi) (ft) 24.58

Purge End Date/Time: 9/18/19/1455

Depth to Well Bottom (ft) ~~31~~ 29.52

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~22-27~~ 21.75-26.75 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): ~~24.5~~ 26

Pump Start Time: 1455

Ferrous Iron (Required Y or N) N mg/L

Second DTW 24.58

APTIM

Sample Collection Log

Location ID: 16EW02 Sample No: 16EW02-1909_18

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
9/18/19	1425	100	.5	24.64	5.78	22.43	6.45	0.0	140	0.97
	1430	100	1.0	24.67	5.70	21.36	6.20	0.0	162	0.64
	1435	100	1.5	24.69	5.65	21.20	6.16	0.0	169	0.90
	1440	100	2.0	24.71	5.62	21.20	6.16	0.0	170	1.05
	1445	100	2.5	24.73	5.60	21.18	6.16	0.0	170	1.07
	1450	100	3.0	24.75	5.60	21.19	6.17	0.0	171	1.08
	1455	100	3.5	24.77	5.59	21.17	6.16	0.0	171	1.11

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW06**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16EW06-1909~~18~~

DATE/TIME: 9/18/19 / 1335

~~**Sample Interval:** 23.8 - 23.8~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16EW06 - 60916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 6

Purge Start Date/Time: 9/18/19/1310

Depth to Water - Initial (DTWi) (ft) 23.03

Purge End Date/Time: 9/18/19/1335

Depth to Well Bottom (ft) ~~58~~ 56.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~50 - 55~~ 49.72-54.72 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 52.5

Pump Start Time: 1318

Ferrous Iron (Required Y or N) N mg/L

Second DTW 23.03

APTIM

Sample Collection Log

Location ID: 16EW06				Sample No: 16EW06-1909_18						
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
9/18/19	1310	100	.5	23.08	9.64	23.97	6.73	4.1	44	1.09
	1315	100	1.0	23.10	9.90	22.35	6.30	7.4	49	0.64
	1320	100	1.5	23.12	9.85	22.12	6.23	8.1	53	0.59
	1325	100	2.0	23.14	9.82	22.03	6.19	7.9	56	0.54
	1330	100	2.5	23.16	9.80	22.01	6.19	7.8	56	0.53
	1335	100	3.0	23.18	9.79	22.02	6.18	7.8	58	0.53

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW12**

Sampler(s): [illegible]

FIELD CONDITIONS

Cmy

SAMPLING INFORMATION

Sample No: 16WW12-190918

DATE/TIME: 9/18/19 / 0959

~~**Sample Interval:**~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LAAAP - TB 50 190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 4

Purge Start Date/Time: 9/18/19 922

Depth to Water - Initial (DTWi) (ft) 17.55

Purge End Date/Time: 9/18/19

Depth to Well Bottom (ft) ~~24~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.1

Screen Interval (ft): 16.64-26.64 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 19

Pump Start Time: 922

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW12				Sample No: 16WW12-1909_14						
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
9/18/19	929	250		17.60	5.802	20.84	5.74	0.0	160.1	0.00
	934			17.61	5.796	20.50	5.77	17.3	160.8	0.77
	939			17.62	5.788	20.44	5.78	17.3	161.5	0.57
	944			17.62	5.779	20.41	5.78	17.5	161.9	0.48
	949			17.63	5.774	20.37	5.79	17.9	162.5	0.39
	954			17.64	5.774	20.31	5.79	16.8	163.0	0.33
	959			17.64	5.774	20.29	5.79	16.5	163.3	0.34

Logged by: [signature] Date: 9/18/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW13**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16WW13-190918

DATE/TIME: 9/18/19 / 0845

~~**Sample Interval:** 9.21 - 9.38~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16LHAAP-753-190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 9/18/19/0845

Depth to Water - Initial (DTWi) (ft) 9.21ft

Purge End Date/Time: 9/18/19/0910

Depth to Well Bottom (ft) ~~24~~ 22.86

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~14-24ft~~ 16.73-26.73 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 19

Pump Start Time: 0845

Ferrous Iron (Required Y or N) N mg/L

Second DTW 9.21ft

APTIM

Sample Collection Log

Location ID: 16WW13				Sample No: 16WW13-1909 18						
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
9/18/19	0845	100	.5	9.27	1.69	20.80	5.52	2.6	199	0.39
	0850	100	1.0	9.30	1.66	20.58	5.52	1.4	194	0.32
	0855	100	1.5	9.32	1.60	20.54	5.52	1.3	191	0.19
	0900	100	2.0	9.34	1.57	20.57	5.53	1.3	191	0.17
	0905	100	2.5	9.36	1.55	20.54	5.53	1.2	190	0.17
	0910	100	3.0	9.38	1.54	20.56	5.52	1.3	190	0.16

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW14**

Sampler(s): Wesley Garcia

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW14-190916

DATE/TIME: 9/16/19, 1343

~~**Sample Interval:**~~ ___ - ___

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample: Clear

Assoc. QC Samples: 16LHAAP-TB1-190916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 24.60

Depth to Well Bottom (ft) ~~29~~ Not recorded

Screen Interval (ft): 20.63-30.63 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): 22

Ferrous Iron (Required Y or N) ____ mg/L

Purging Method/Equipment: Pump

Purge Start Date/Time: 9/16/19 1306

Purge End Date/Time: " 1345

Discharge Tube Length: ____

PID Reading: 0.0

Discharge Tube Diameter: ____

Immersible Layer: Y / N

Pump Start Time: 1306

APTIM

Sample Collection Log

Location ID: 16WW14				Sample No: 16WW14-1909 16						
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 0.3~~ mg/L
9/16/19	1312	250		24.98	0.007	24.40	6.77	173.6	-27.4	~~3.41~~ 1.57
	1322			25.05	3.682	22.22	6.22	187.7	16.2	1.45
	1327			25.13	3.669	22.59	6.20	164.4	18.0	0.93
	1332			25.17	3.661	22.96	6.19	114.6	21.0	0.88
	1337			25.19	3.678	22.63	6.17	101.2	22.0	0.87
	1342			25.19	3.683	22.9	6.17	96.4	24.0	0.88

Logged by: [signature] Date: 9/16/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW16**

Sampler(s): [illegible]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW16-1909 16

DATE/TIME: 9/16/19 1434

~~**Sample Interval:**~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TBL-190916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 4

Purge Start Date/Time: 9/16/19 @ 1358

Depth to Water - Initial (DTWi) (ft) 21.37

Purge End Date/Time: 9/16/19 @ 1438

Depth to Well Bottom (ft) ~~29~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 21.62-31.62 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 24

Pump Start Time: 1358

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW16 Sample No: 16WW16-1909_16

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	-	PTW	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
9/16/19	1403	280	21.50	21.50	4.664	21.62	6.22	118.6	80.6	0.70
	1413		21.50	21.89	4.627	21.89	6.11	0.0	60.6	0.00
	1418		21.50	21.89	4.605	21.88	6.32	191.7	63.0	0.28
	1423		21.50	21.88	4.577	21.87	6.07	220	62.4	0.32
	1428		21.50	21.82	4.566	21.82	6.16	116.2	60.5	0.28
	1433		21.50	21.66	4.548	21.66	6.12	110.2	58.9	0.28

Logged by: [signature] Date: 9/16/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW22**

Sampler(s): [illegible]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW22-190917

DATE/TIME: 9/17/19 937

~~**Sample Interval:** - -~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample: Clear

Assoc. QC Samples: IL-HAAP-TRL-190917

Decontamination Procedures:

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: Peristaltic LF

Casing ID (in.): 4

Purge Start Date/Time: 9/17/19 857

Depth to Water - Initial (DTWi) (ft) 27.22

Purge End Date/Time: 9/17/19 940

Depth to Well Bottom (ft) ~~32~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.1

Screen Interval (ft): 23.94-33.94 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 26

Pump Start Time: 857

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW22				Sample No: 16WW22-190917						
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
9/17/19	901	250		27.30	3.600	20.49	6.22	397.1	-9.5	8.8
	911			27.43	3.594	20.49	6.25	97.1	-18.1	0.36
	916			27.51	3.599	20.56	6.37	113.1	-21.8	0.31
	921			27.62	3.642	20.77	6.18	79.1	-20.8	0.26
	926			27.74	3.652	20.82	6.14	35.7	-20.1	0.25
	931			27.78	3.668	20.80	6.09	30.9	-19.7	0.24
	936			27.80	3.671	20.93	6.05	28.4	-17.7	0.23

Logged by: [signature] Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW23**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16WW23-1909 17

DATE/TIME: 9/17/19 / 1350

~~**Sample Interval:** 8.35 - 8.54~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16 TFHAAP-TB2-1909 17

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 9/17/19 / 1320

Depth to Water - Initial (DTWi) (ft) 8.35ft

Purge End Date/Time: 9/17/19 / 1350

Depth to Well Bottom (ft) ~~35~~ 37.20ft

Discharge Tube Length: _____

PID Reading: _____

Screen Interval (ft): ~~27.4-37.6~~ 27.2-37.2 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): ~~29~~ ~~30.00~~ 32ft

Pump Start Time: _____

Ferrous Iron (Required Y or N) N mg/L

Second DTW 8.35ft

APTIM

Sample Collection Log

Location ID: 16WW23			Sample No: 16WW23-1909 17							
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
9/17/19	1320	100	.5	8.41	2.19	23.45	5.99	66.4	21	0.46
	1325	100	1.0	8.43	2.40	22.16	6.07	37.8	14	0.16
	1330	100	1.5	8.45	2.43	21.54	6.09	32.8	8	0.16
	1335	100	2.0	8.47	2.43	21.50	6.09	32.9	8	0.16
	1340	100	2.5	8.49	2.43	21.48	6.07	33.1	7	0.14
	1345	100	3.0	8.51	2.43	21.44	6.07	32.8	8	0.14
	1350	100	3.5	8.54	2.43	21.45	6.07	32.8	8	0.14

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW24**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16WW24-1909~~17~~

DATE/TIME: 9/17/19 / 1455

~~**Sample Interval:** 14.29~~ ___

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16LHAAP-TBZ-1909~~17~~

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 9/17/19/1430

Depth to Water - Initial (DTWi) (ft) 10.29

Purge End Date/Time: 9/17/19/1455

Depth to Well Bottom (ft) ~~17~~ 19.26 ft

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~14.5-19 ft~~ 14.29-19.29 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): ~~13.5~~ 16.5 ft

Pump Start Time: 1430

Ferrous Iron (Required Y or N) N mg/L

APTIM

Sample Collection Log

Location ID: 16WW24				Sample No: 16WW24-1909/17						
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
9/17/19	1430	100	.5	10.35	2.37	21.80	3.93	7.6	338	0.61
	1435	100	1.0	10.37	2.38	21.66	3.86	7.4	344	0.49
	1440	100	1.5	10.39	2.29	21.63	3.80	6.5	354	0.44
	1445	100	2.0	10.42	2.26	21.60	3.77	6.3	355	0.44
	1450	100	2.5	10.45	2.23	21.59	3.76	6.3	357	0.43
	1455	100	3.0	10.48	2.22	21.57	3.76	6.2	357	0.44

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW25**

Sampler(s): W Gaven

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW25-190919

DATE/TIME: 9/19/19 930

~~**Sample Interval:**~~ ___ - ___

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample: Clear

Assoc. QC Samples: 16WW25-190919-FD; 16LHAAP-TB6-190919

Decontamination Procedures:

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPD

Casing ID (in.): 4

Purge Start Date/Time: 9/19/19 856

Depth to Water - Initial (DTWi) (ft) 18.39

Purge End Date/Time: 9/19/19 932

Depth to Well Bottom (ft) ~~50~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.2

Screen Interval (ft): 42.25-52.25 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 44

Pump Start Time: 856

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW25**

Project No: **501032**

Sampler(s): [illegible]

FIELD CONDITIONS

Sny

SAMPLING INFORMATION

Sample No: 16WW25-190919-FD

DATE/TIME: 9/19/19 / 9:30

~~**Sample Interval:**~~

L George 05/21/2020

Sampling Method: LP

Sample Purpose: FD

Sample Matrix: GW

Appearance of Sample

Clear

Assoc. QC Samples

16LHAAP-TB6-190919

vs ~~16WW25-190919-FD~~

16WW25-190919

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LPP

Casing ID (in.): 4

Purge Start Date/Time: 9/19/19 8:56

Depth to Water - Initial (DTWi) (ft) 18.39

Purge End Date/Time: 9/19/19 9:32

Depth to Well Bottom (ft) ~~50~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.2

Screen Interval (ft): 42.25-52.25 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 44

Pump Start Time: 8:56

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW25				Sample No: 16WW25-1909 19						
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
9/19/19	900	250		18.49	2.935	21.31	5.95	62.4	40.0	2.21
	905			18.56	7.700	20.21	5.36	160.4	12.4	0.43
	910			18.64	7.760	19.94	5.42	199.2	5.1	0.37
	915			18.71	7.830	20.01	5.62	162.4	-5.9	0.31
	920			18.75	7.945	19.92	5.59	174.2	-14.6	0.26
	925			18.77	7.905	19.98	5.64	179.1	-15.7	0.22
	930			18.78	7.927	20.01	5.68	188.7	-18.2	0.20

Logged by: [signature] Date: 9/19/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW26**

Sampler(s): W Green

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW26-190917

DATE/TIME: 9/17/19 1555

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample: tan

Assoc. QC Samples: 16LHAAP-TB3-190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 16.86

Depth to Well Bottom (ft) ~~18.5~~ Not recorded

Screen Interval (ft): 15.97-20.97 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): 15

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: LFMD

Purge Start Date/Time: 9/17/19 1518

Purge End Date/Time: 9/17/19 1555

Discharge Tube Length: _____

PID Reading: 0.1

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Pump Start Time: 15.19

APTIM

Sample Collection Log

Location ID: 16WW26				Sample No: 16WW26-1909~~16~~17						
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
~~9/16~~ 9/17/16	1523	250	—	17.24	3.182	21.99	5.24	140.3	250	0.43
	1528			18.52	3.172	21.90	5.23	56.2	28.7	0.00
	1537			18.71	3.154	21.92	5.20	0.0	23.4	0.00
	1538			18.98	3.140	21.93	5.19	-8.0	24.3	0.00
	1543			18.95	3.074	21.94	5.20	146.4	8.2	0.36
	1546			18.00	3.040	21.95	5.21	102.3	3.7	0.45
	1553			18.03	3.020	22.05	5.21	101.4	-1.6	0.44

Logged by: [signature] Date: 9/17/15

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW27**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS Clear/Sunny

SAMPLING INFORMATION

Sample No: 16WW27-190917

DATE/TIME: 190917 / 1025

~~**Sample Interval:** 8.21 - 8.38~~
L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16-H AAP-TB1-190916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 190917/1000

Depth to Water - Initial (DTWi) (ft) 8.21ft

Purge End Date/Time: 190917/1025

Depth to Well Bottom (ft) ~~50~~ 39.31ft

Discharge Tube Length: _____

PID Reading: _____

Screen Interval (ft): ~~29-39ft~~ 29.1-39.1 FT BTOC

Discharge Tube Diameter: 1/4

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): ~~30~~ 34ft

Pump Start Time: _____

Ferrous Iron (Required Y or N) N mg/L

Second DTW 8.21ft

APTIM

Sample Collection Log

Location ID: 16WW27				Sample No: 16WW27-1909 17						
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)
190917	Purge Stabilization Criteria	-	-	Drawdown limit 0.3 ft	±10%		±0.1 units	No criteria		± 10% or 0.2 mg/L
	1000	100	.5	8.27	3.57	21.11	5.89	400	-16	0.45
	1005	100	1.0	8.29	3.62	20.53	5.97	107	-23	0.06
	1010	100	1.5	8.31	3.62	20.52	5.98	93.0	-26	0.06
	1015	100	2.0	8.33	3.63	20.53	5.98	92.3	-27	0.05
	1020	100	2.5	8.36	3.63	20.53	5.99	92.1	-26	0.04
	1025	100	3.0	8.38	3.63	20.53	5.99	91.7	-26	0.04

Logged by: _____ Date: 190917

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW29**

Sampler(s): [illegible]

FIELD CONDITIONS

Sny

SAMPLING INFORMATION

Sample No: 16WW29-1909 16

DATE/TIME: 6/18/19 / ~~1600~~ 1607

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample [illegible]

Assoc. QC Samples 16LTAAP-TB5-190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) ~~[illegible]~~ 16.06

Depth to Well Bottom (ft) ~~43~~ Not recorded

Screen Interval (ft): 40.08-45.08 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): 39.5

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: LFPP

Purge Start Date/Time: ~~[illegible]~~ 6/18/19 @ 1124

Purge End Date/Time: 6/18/19 1209

Discharge Tube Length: _____

PID Reading: 0.0

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Pump Start Time: 1124

APTIM

Sample Collection Log

Location ID: 16WW29				Sample No: 16WW29-1909 14						
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
6/16/19	1137	250		17.04	1.438	21.07	6.33	7.7	53.8	3.43
	1142			17.07	1.440	20.66	6.29	0.0	78.2	0.00
	1147			17.10	1.432	20.69	6.29	5.5	-80.3	3.12
	1152			17.15	1.433	20.57	6.29	5.2	-89.3	3.09
	1157			17.18	1.430	20.58	5.99	5.3	-32.4	0.55
	1202			17.20	1.428	20.59	5.93	5.0	-28.7	0.46
	1207			17.22	1.427	20.60	5.85	5.1	-39.1	0.42

Logged by: [illegible] Date: 6/16/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP** Location ID: **16WW30**

Project No: **501032** Sampler(s): [illegible]

FIELD CONDITIONS [illegible]

SAMPLING INFORMATION

Sample No: 16WW30-1909~~19~~ **DATE/TIME:** 9/18/19 1114 ~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF **Sample Purpose:** REG **Sample Matrix:** GW

Appearance of Sample [illegible] **Assoc. QC Samples** 16LHAAP TB3-[illegible] **Decontamination Procedures**

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF PP

Casing ID (in.): 4 Purge Start Date/Time: 9/18/19 1030

Depth to Water - Initial (DTWi) (ft) 15.98 Purge End Date/Time: 9/18/19 1114

Depth to Well Bottom (ft) ~~31~~ Not recorded Discharge Tube Length: _____ PID Reading: 0.4

Screen Interval (ft): 28.14-33.14 FT BTOC Discharge Tube Diameter: _____ Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 27.5 Pump Start Time: 1038

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW30 Sample No: 16WW30-1909 19

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
9/14/19	1041	250		16.42	1.362	20.49	6.25	66.8	-47.6	1.16
	1046			16.86	1.332	20.20	6.16	53.6	-46.5	0.49
	1051			16.98	1.331	20.16	6.14	31.6	-46.1	0.48
	1056			17.11	1.306	20.19	6.13	19.3	-47.7	0.32
	1101			17.26	1.288	20.01	6.14	9.9	-44.2	0.27
	1106			17.31	1.271	20.13	6.14	4.3	-50.8	0.24
	1111			17.33	1.269	20.11	6.14	3.2	-54.3	0.22

Logged by: [signature] Date: 9/14/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW35**

Sampler(s): Kennie Moore

FIELD CONDITIONS

SAMPLING INFORMATION

Sample No: 16WW35-1909 18

DATE/TIME: 9/18/19 / 1055

Sample Interval: ~~17.57 - 17.72~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16LHMP-TB3-1909 18

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 9/18/19/1030

Depth to Water - Initial (DTWi) (ft) 17.57ft

Purge End Date/Time: 9/18/19/1055

Depth to Well Bottom (ft) ~~44~~ 46.51ft

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~36.5-46.5ft~~ 36.58-46.58 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): ~~38.5~~ 41.5ft

Pump Start Time: 10.30

Ferrous Iron (Required Y or N) N mg/L

Second DTW 17.57ft

APTIM

Sample Collection Log

Location ID: 16WW35 Sample No: 16WW35-1909_18

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
9/18/19	1030	100	.5	17.62	13.6	22.36	6.37	12.0	161	0.48
	1035	100	1.0	17.64	13.9	21.16	6.56	13.4	152	0.36
	1040	100	1.5	17.66	14.0	20.67	6.62	14.3	144	0.32
	1045	100	2.0	17.68	14.0	20.64	6.63	14.1	144	0.27
	1050	100	2.5	17.70	14.1	20.62	6.63	14.1	143	0.27
	1055	100	3.0	17.72	14.2	20.59	6.64	14.0	143	0.26

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW36**

Sampler(s): [signature]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW36-190916

DATE/TIME: 9/16/19 1537

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample: golden

Assoc. QC Samples: 16LHAAP-TB1-190916

Decontamination Procedures:

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 4

Purge Start Date/Time: 9/16/19 1501

Depth to Water - Initial (DTWi) (ft) 17.01

Purge End Date/Time: 9/16/19 1540

Depth to Well Bottom (ft) ~~22~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 19.49-24.49 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 19

Pump Start Time: 1501

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW36				Sample No: 16WW36-190916						
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
9/16/19	1506	250		17.30	9.922	22.50	5.96	12.3	121.9	1.25
	1516			17.38	9.182	22.22	5.97	22.2	117.6	0.31
	1521			17.40	8.954	22.21	5.97	1.6	115.5	0.29
	1526			17.41	8.589	22.05	5.97	1.5	106.5	0.25
	1531			17.42	8.564	21.88	5.99	2.0	89.0	0.23
	1536			17.45	8.561	21.86	5.98	1.1	87.4	0.21

Logged by: [signature] Date: 9/16/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW39**

Sampler(s): V Garcia

FIELD CONDITIONS Sunny

SAMPLING INFORMATION

Sample No: 16WW39-1909 17

DATE/TIME: 9/17/19 / 1143

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB2-190917

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 2

Purge Start Date/Time: 9/17/19 1105

Depth to Water - Initial (DTWi) (ft) 21.0

Purge End Date/Time: 9/17/19 1148

Depth to Well Bottom (ft) ~~26.5~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.1

Screen Interval (ft): 18-28 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): -99

Pump Start Time: 1105

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW39				Sample No: 16WW39-190917						
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
9/17/19	1108	250		20.43	5.807	21.26	5.98	86.0	120.3	0.37
	1113			20.50	5.763	21.23	5.97	123.4	115.7	0.35
	1118			20.55	5.744	21.19	5.97	179.3	105.3	0.34
	1123			20.57	5.669	20.95	5.98	104.0	104.0	0.27
	1128			20.60	5.657	20.99	5.95	44.2	35.9	0.25
	1133			20.62	5.640	20.81	5.99	96.4	25.4	0.25
	1138			20.65	5.607	20.55	5.97	105.4	23.5	0.24
	1143			20.66	5.599	20.50	5.97	105.3	24.1	0.23

Logged by: N. Garcia Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW40**

Sampler(s): LG

FIELD CONDITIONS

Cry

SAMPLING INFORMATION

Sample No: 16WW40-190917

DATE/TIME: 9/17/19 1409

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB2-A0917

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 2

Depth to Water - Initial (DTWi) (ft) 16.35

Depth to Well Bottom (ft) ~~18.5~~ Not recorded

Screen Interval (ft): 10.8-20.8 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): -99

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: LFPD

Purge Start Date/Time: 9/17/19 1334

Purge End Date/Time: 9/17/19

Discharge Tube Length: _____

PID Reading: 0.0

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Pump Start Time: 1324

APTIM

Sample Collection Log

Location ID: 16WW40				Sample No: 16WW40-1909 17						
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
9/17/19	1339	250		1149	6.091	24.46	5.62	136	62.7	1.53
	1344			1153	6.099	24.32	5.62	95.5	61.6	1.84
	1349			1159	6.113	24.27	5.65	79.8	57.9	1.95
	1354			1164	6.261	24.18	5.81	74.3	32.5	1.77
	1359			1166	6.300	24.17	5.84	21.9	23.4	2.00
	1404			1171	6.342	24.22	5.87	22.6	12.4	2.03
	1409			1173	6.295	24.23	5.88	25.6	7.8	2.09

Logged by: W Gam Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW41**

Sampler(s): [illegible]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW41-1909 17

DATE/TIME: 9/17/19 1035

~~**Sample Interval:**~~ L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clr

Assoc. QC Samples 16LHAAP-TB2 190917

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 4

Purge Start Date/Time: 9/17/19 959

Depth to Water - Initial (DTWi) (ft) 25.43

Purge End Date/Time: 9/17/19 1035

Depth to Well Bottom (ft) ~~51~~ Not recorded

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 42.6-52.6 FT BTOC

L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 45

Pump Start Time: 959

Ferrous Iron (Required Y or N) _____ mg/L

?/

APTIM

Sample Collection Log

Location ID: 16WW41				Sample No: 16WW41-1909 17						
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
9/17/19	1004	250		26.86	0.040	24.64	6.92	-5.5	41.8	0.00
	1014			28.27	14.17	22.55	6.18	298.7	91.0	0.37
	1019			28.84	14.18	22.79	6.17	275.7	95.7	0.34
	1024			28.97	14.20	23.10	6.16	258.2	100.2	0.30
	1029			28.03	14.20	23.48	6.14	257.3	104.5	0.29
	1034			28.96	14.22	23.51	6.18	106.8	109.5	0.27

Logged by: [signature] Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW42**

Sampler(s): [illegible]

FIELD CONDITIONS

Cloudy

SAMPLING INFORMATION

Sample No: 16WW42-1909 16

DATE/TIME: 9/16/19 ~~1558~~ 1633

~~**Sample Interval:** - -~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB1-190916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 11.39

Depth to Well Bottom (ft) ~~12~~ Not recorded

Screen Interval (ft): 6.57-16.57 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): 7

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: Pump LF

Purge Start Date/Time: 9/16/19 1558

Purge End Date/Time: 9/16/19 1636

Discharge Tube Length: _____

PID Reading: 0.3

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Pump Start Time: 1558

APTIM

Sample Collection Log

Location ID: 16WW42				Sample No: 16WW42-1909 16						
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
9/16/19	1602	250	—	1186	1.324	24.14	6.00	29.21	-20.7	0.90
	1612			1214	1.157	24.17	5.92	27.0	-48.4	1.02
	1617			1219	1.158	24.49	5.95	27.8	-50.7	1.70
	1622			1222	1.160	25.03	5.99	38.1	-45.9	1.78
	1627			1227	1.164	26.14	6.06	43.5	-34.1	1.86
	1632			1230	1.165	26.19	6.10	21.7	-31.4	1.89

Logged by: [signature] Date: 9/16/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW43**

Project No: **501032**

Sampler(s): Kennie Moore

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 16WW43-190917

DATE/TIME: 9/17/19 / 1235

~~**Sample Interval:** 9.98 - 10.15~~

L George 05/21/2020

Sampling Method:

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Assoc. QC Samples 16LHAAP-TB1-190916

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LF/BP

Casing ID (in.): 4

Purge Start Date/Time: 9/17/19/1210

Depth to Water - Initial (DTWi) (ft) 9.98 ft

Purge End Date/Time: 9/17/19/1235

Depth to Well Bottom (ft) 15.48 ft

Discharge Tube Length: _____

PID Reading: _____

Screen Interval (ft): ~~5 ft - 15 ft~~ 4.59-14.59 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 12.5 ft

Pump Start Time: _____

Ferrous Iron (Required Y or N) N mg/L

Second DTW 9.98 ft

APTIM

Sample Collection Log

Location ID: 16WW43				Sample No: 16WW43-1909 17						
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
9/17/19	1210	100	.5	9.98	0.464	26.80	6.22	6.6	41	0.54
	1215	100	1.0	10.05	0.337	24.37	6.16	10.1	39	0.10
	1220	100	1.5	10.07	0.309	23.94	5.96	11.7	42	0.10
	1225	100	2.0	10.09	0.309	23.91	5.93	11.7	43	0.09
	1230	100	2.5	10.12	0.307	23.87	5.93	11.6	43	0.09
	1235	100	3.0	10.15	0.307	23.88	5.92	11.6	42	0.09

Logged by: _____ Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW48**

Project No: **501032**

Sampler(s): [illegible]

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 16WW48-1909 18

DATE/TIME: 9/18/19 / 1720

~~**Sample Interval:** - -~~
L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB3-190918

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: PPLF

Casing ID (in.): 4

Purge Start Date/Time: 9/18/19 1646

Depth to Water - Initial (DTWi) (ft) 1335

Purge End Date/Time: 9/18/19 1720

Depth to Well Bottom (ft) Not recorded

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 12.95-22.95 FT BTOC
L George 05/21/2020

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 15

Pump Start Time: 1646

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW48				Sample No: 16WW48-1909/18						
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
9/18/19	16.50	250		1348	5.793	21.79	5.76	0.0	79.3	0.00
	16.55			1350	5.791	21.49	5.78	2.88	89.1	0.87
	1700			1351	5.770	21.33	5.80	6.6	105.6	0.48
	1705			1353	5.760	21.30	5.80	7.1	107.5	0.40
	1710			1354	5.765	21.36	5.80	6.5	113.2	0.36
	1715			1355	5.793	21.38	5.80	11.9	120.9	0.27
	1720			1356	5.709	21.39	5.80	8.3	124.7	0.25

Logged by: [signature] Date: 9/18/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW49**

Project No: **501032**

Sampler(s): [illegible]

FIELD CONDITIONS

[illegible]

SAMPLING INFORMATION

Sample No: 16WW49-1909 19

DATE/TIME: 9/19/19 / ~~435~~

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAP-TB6-190919

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Bromide by E300 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 4

Purge Start Date/Time: 9/19/19 801

Depth to Water - Initial (DTWi) (ft) 19.21

Purge End Date/Time: 9/19/19 839

Depth to Well Bottom (ft) 57?

Discharge Tube Length: _____

PID Reading: 0.1

Screen Interval (ft): 45.03-55.03 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): Screen Interval Not Defined

Pump Start Time: 801

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW49 Sample No: 16WW49-1909 19										
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
9/19/19	805	250		21.54	2.515	20.47	6.10	0.0	-12.1	0.00
	810			21.71	2.484	20.29	6.16	20.7	-21.9	0.60
	815			21.76	2.485	20.24	6.16	27.0	-23.4	0.52
	820			21.81	2.484	20.24	6.16	23.4	-24.3	0.54
	825			21.85	2.496	20.24	6.17	33.6	-25.4	0.57
	830			21.88	2.477	20.26	6.17	38.5	-26.5	0.46
	835			21.91	2.474	20.30	6.16	26.8	-27.3	0.44

Logged by: [signature] Date: 9/19/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP** Location ID: **16WW51**

Project No: **501032** Sampler(s): [illegible]

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 16WW51-1909 (4) **DATE/TIME:** 9/18/19 1800

~~**Sample Interval:**~~ L George 05/21/2020

Sampling Method: LF **Sample Purpose:** REG **Sample Matrix:** GW

Appearance of Sample Cloudy **Assoc. QC Samples** 16LHAAP-TB3-190918 **Decontamination Procedures**

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 2 Purge Start Date/Time: 9/18/19 1726

Depth to Water - Initial (DTWi) (ft) 13.61 Purge End Date/Time: 9/18/19

Depth to Well Bottom (ft) Not recorded Discharge Tube Length: _____ PID Reading: 0.2

Screen Interval (ft): 34.13-44.13 FT BTOC Discharge Tube Diameter: _____ Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): Screen Interval Not Defined Pump Start Time: _____

Ferrous Iron (Required Y or N) _____ mg/L

Date	Tm	PR	TP	ptw	cond	temp	pH	Tur.	ORP	DO
9/18/19	1720	250	—	13.66	3.314	21.60	6.04	2.4	-69.6	1.30
	1735			14.04	3.270	21.12	6.05	8.2	-78.7	0.53
	1740			14.16	3.251	20.88	6.06	5.6	-82.0	0.38
	1745			14.24	3.232	20.79	6.06	0.7	-84.0	0.31
	1750			14.31	3.219	20.71	6.06	8.4	-89.1	0.21
	1755			14.35	3.226	20.72	6.04	0.0	-89.4	0.00
	1800			14.36	3.227	20.77	6.06	0.0	-90.8	0.00

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW55**

Sampler(s): [illegible]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW55-1909 17

DATE/TIME: 9/17/19 1454

~~**Sample Interval:**~~ ___ ___

L George 05/21/2020

Sampling Method: LFPP

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB2-190917

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4

Depth to Water - Initial (DTWi) (ft) 20.62

Depth to Well Bottom (ft) Not recorded

Screen Interval (ft): 19.92-29.92 FT BTOC

L George 05/21/2020

Approximate depth of pump inlet*(ft): 22

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: LFPP

Purge Start Date/Time: 9/17/19 1425

Purge End Date/Time: 9/17/19 1457

Discharge Tube Length: _____

PID Reading: 0.0

Discharge Tube Diameter: _____

Immersible Layer: Y / N

Pump Start Time: 1425

APTIM

Sample Collection Log

Location ID: 16WW55 Sample No: 16WW55-1909-17

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
9/17/19	1429	250		20.95	4.852	22.54	6.17	8.9	77.5	0.00
	1434			20.96	4.849	22.33	6.18	7.4	79.9	0.36
	1439			20.87	4.832	22.03	6.17	2.3	84.0	0.28
	1444			20.90	4.819	21.91	6.17	1.0	87.1	0.23
	1449			20.94	4.817	21.90	6.16	0.6	88.3	0.21
	1454			20.94	4.821	21.85	6.17	0.0	90.7	0.20

Logged by: [signature] Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW56**

Sampler(s): L George

FIELD CONDITIONS Hot

SAMPLING INFORMATION

Sample No: 16WW56-190917

DATE/TIME: 9/17/19 1312

~~**Sample Interval:**~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16-11AAP-TB2-190917

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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: LFPP

Casing ID (in.): 2in PVC

Purge Start Date/Time: 9/17/19 @ 1234

Depth to Water - Initial (DTWi) (ft) 26.50

Purge End Date/Time: 9/17/19

Depth to Well Bottom (ft) 42.79

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 24.26-34.26 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): Screen Interval Not Defined

Pump Start Time: 1234

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW56				Sample No: 16WW56-1909[illegible]						
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
9/17/19	1242	250		26.68	3.743	23.74	5.86	86.1	124.4	0.00
	1247			26.69	3.697	23.61	5.98	30.4	22.3	0.00
	1252			26.69	3.684	23.56	5.99	4.3	27.4	0.00
	1257			26.69	3.663	23.42	6.01	5.5	28.4	0.00
	1302			26.69	3.501	23.33	6.03	2.7	31.0	0.25
	1307			26.70	3.444	23.20	6.04	3.4	32.5	0.23
	1312			26.70	3.440	23.18	6.05	2.6	33.7	0.22

Logged by: [illegible] Date: 9/17/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW57**

Project No: **501032**

Sampler(s): [illegible]

FIELD CONDITIONS

Rain

SAMPLING INFORMATION

Sample No: 16WW57-190914

DATE/TIME: 9/18/19 1530

~~**Sample Interval:**~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample

Clr

Assoc. QC Samples

16LHAAP-TB5-190918

16WW57-190918 MS

16WW57-190918 MSD

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Anions (nitrate/sulfate/bromide) in Water by 9056, Alkalinity in Water by SM2320B	1 x 250 mL HDPE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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
		MI	DHC in Water by CENSUS-qPCR	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: LFPP

Casing ID (in.): 2

Purge Start Date/Time: 9/18/19 1500

Depth to Water - Initial (DTWi) (ft) 5.86

Purge End Date/Time: 9/18/19 1600

Depth to Well Bottom (ft) Not recorded

Discharge Tube Length: _____

PID Reading: 0.0

Screen Interval (ft): 29.94-39.94 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): Screen Interval Not Defined

Pump Start Time: 1500

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW57				Sample No: 16WW57-1909(4)						
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
9/18/19	1505	240	—	6.00	1.372	22.27	6.61	0	-66.3	1.30
	1510			6.05	1.729	21.44	6.64	2.4	-61.1	0.50
	1515			6.08	2.580	20.92	6.23	0.4	-23.1	0.34
	1520			6.12	3.556	20.70	5.66	0.4	7.6	0.28
	1525			6.13	3.571	20.75	5.68	0.4	10.1	0.19
	1530			6.15	3.577	20.74	5.69	0.4	13.6	0.17

Logged by: [signature] Date: 9/18/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW58**

Sampler(s): [illegible]

FIELD CONDITIONS

Sunny

SAMPLING INFORMATION

Sample No: 16WW58-1909 16

DATE/TIME: 9/18/19 1408

~~**Sample Interval:** ___ - ___~~

L George 05/21/2020

Sampling Method: LF

Sample Purpose: REG

Sample Matrix: GW

Appearance of Sample Clear

Assoc. QC Samples 16LHAAP-TB6-190919

Decontamination Procedures

Chain of Custody	COC Notes	Lab	Analyses	Container	Preserv
		ALSHT	Anions (nitrate/sulfate/bromide) in Water by 9056, Alkalinity in Water by SM2320B	1 x 250 mL HDPE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		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
		MI	DHC in Water by CENSUS-qPCR	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: _____

Casing ID (in.): 2

Purge Start Date/Time: 9/18/19 1334

Depth to Water - Initial (DTWi) (ft) ~~8.100~~ 8.20

Purge End Date/Time: 9/18/19 1415

Depth to Well Bottom (ft) Not recorded

Discharge Tube Length: _____

PID Reading: 0.3

Screen Interval (ft): 31.92-41.92 FT BTOC

Discharge Tube Diameter: _____

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): Screen Interval Not Defined

Pump Start Time: 1334

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW58 Sample No: 16WW58-190918

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
9/18/19	1338	200		6.83	2.441	21.92	5.92	0.0	-34.9	0.87
	1343			6.86	2.430	21.67	6.00	2.6	-65.6	0.42
	1348			6.94	2.418	21.37	6.01	1.0	-68.6	0.31
	1353			9.03	2.414	21.05	6.03	0.3	-71.8	0.25
	1358			9.10	2.416	20.71	6.04	0.5	-74.3	0.20
	1403			9.14	2.751	20.77	6.00	0.6	-77.7	0.18
	1408			9.14	2.761	20.86	5.98	0.7	-78.1	0.16

Logged by: N Garcia Date: 9/18/19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16IW20**

Project No: **501032**

Sampler(s): Scott Beasinger

FIELD CONDITIONS

Cool / Sunny

SAMPLING INFORMATION

Sample No: 16IW20-191022

DATE/TIME: 10/22/19 1051

Pump Inlet Depth: 19.91

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 10/22/19 1100

Depth to Water - Initial (DTWi) (ft) 17.67

Purge End Date/Time: 10/22/19 1130

Depth to Well Bottom (ft) 25.48

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 14.91 - 24.91 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 19.91

Pump Start Time: 1100

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water - 17.67

APTIM

Sample Collection Log

Location ID: 16IW20 Sample No: 16IW20-191022

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
10/22/19	1105	100	.5	17.75	5.04	18.47	5.97	59.6	-103	0.90
	1110	100	1.0	17.81	5.39	19.20	6.06	53.0	-180	0.24
	1115	100	1.5	17.85	5.43	19.29	6.06	44.1	-179	0.05
	1120	100	2.0	17.88	5.43	19.39	6.07	43.5	-180	0.05
	1125	100	2.5	17.90	5.44	19.47	6.07	42.8	-181	0.04
	1130	100	3.0	17.91	5.44	19.54	6.07	42.0	-182	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW11**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cool / sunny

SAMPLING INFORMATION

Sample No: 16RW11-1910 22

DATE/TIME: 10/22/19 0959

Pump Inlet Depth: 19.49

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Lowflow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 1020

Depth to Water - Initial (DTWi) (ft) 18.65

Purge End Date/Time: 10/22/19 1040

Depth to Well Bottom (ft) 25.62

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 14.49 - 24.49 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 19.49

Pump Start Time: 1020

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water - 18.65

APTIM

Sample Collection Log

Location ID: 16RW11				Sample No: 16RW11-191022						
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
10/22/19	1015	100	.5	18.73	3.40	17.31	5.37	477	40	0.88
	1020	100	1.0	18.80	3.32	18.39	5.26	438	-16	0.32
	1025	100	1.5	18.85	3.34	18.77	5.26	418	-36	0.08
	1030	100	2.0	18.88	3.35	18.85	5.27	416	-37	0.08
	1035	100	2.5	18.90	3.35	18.92	5.27	415	-38	0.07
	1040	100	3.0	18.92	3.35	18.98	5.27	414	-39	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW12**

Project No: **501032**

Sampler(s): Scott Baessinger

FIELD CONDITIONS COLD / SUNNY

SAMPLING INFORMATION

Sample No: 16RW12-191022 **DATE/TIME:** 10/22/19 0821 **Pump Inlet Depth:** 26.49

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 0830

Depth to Water - Initial (DTWi) (ft) 24.38

Purge End Date/Time: 10/22/19 0900

Depth to Well Bottom (ft) 32.60 FT BTOC

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 21.49-31.49

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 26.49

Pump Start Time: 0830

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 24.38

APTIM

Sample Collection Log

Location ID: 16RW12				Sample No: 16RW12-1910 22						
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
10/22/19	0835	100	.5	24.45	4.39	16.05	6.33	0.5	119	1.48
	0840	100	1.0	24.51	4.41	16.98	6.14	0.0	148	1.11
	0845	100	1.5	24.55	4.43	17.22	6.13	0.0	156	0.91
	0850	100	2.0	24.58	4.44	17.28	6.13	0.0	157	0.90
	0855	100	2.5	24.60	4.44	17.35	6.12	0.0	158	0.89
	0900	100	3.0	24.61	4.44	17.41	6.12	0.0	159	0.88

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW12**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS COLD/SUNNY

SAMPLING INFORMATION

Sample No: 16RW12-191022-FD **DATE/TIME:** 10/22/19 0821 **Pump Inlet Depth:** 26.49

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 0830

Depth to Water - Initial (DTWi) (ft) 24.38

Purge End Date/Time: 10/22/19 0900

Depth to Well Bottom (ft) 32.60

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 21.49 - 31.49 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 26.49

Pump Start Time: 0830

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16RW12	Sample No: 16RW12-1910 22 -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
10/22/19	0835	100	.5	24.45	4.39	16.05	6.33	0.5	119	1.48
	0840	100	1.0	24.51	4.41	16.98	6.14	0.0	148	1.11
	0845	100	1.5	24.55	4.43	17.22	6.13	0.0	156	0.91
	0850	100	2.0	24.58	4.44	17.28	6.13	0.0	157	0.90
	0855	100	2.5	24.60	4.44	17.35	6.12	0.0	158	0.89
	0900	100	3.0	24.61	4.44	17.41	6.12	0.0	159	0.88

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW12**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 16WW12-1910 22

DATE/TIME: 10/22/19 1140

Pump Inlet Depth: 22.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 1150

Depth to Water - Initial (DTWi) (ft) 17.42

Purge End Date/Time: 10/22/19 1220

Depth to Well Bottom (ft) 27.03

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.00 - 27.00~~ 16.64-26.64 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.00

Pump Start Time: 1150

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.42

APTIM

Sample Collection Log

Location ID: 16WW12				Sample No: 16WW12-191022						
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
10/22/19	1155	100	.5	17.50	6.10	19.00	6.08	29.5	-41	0.72
	1200	100	1.0	17.56	6.07	19.17	6.04	30.9	-37	0.25
	1205	100	1.5	17.60	6.02	19.19	6.03	31.3	-37	0.06
	1210	100	2.0	17.63	6.02	19.22	6.02	31.7	-37	0.05
	1215	100	2.5	17.66	6.01	19.24	6.02	32.4	-37	0.06
	1220	100	3.0	17.68	6.01	19.26	6.02	32.8	-37	0.05

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW22**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cold / Sunny

SAMPLING INFORMATION

Sample No: 16WW22-191022 **DATE/TIME:** 10/22/19 0723 **Pump Inlet Depth:** 30.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 0735

Depth to Water - Initial (DTWi) (ft) 27.40

Purge End Date/Time: 10/22/19 0805

Depth to Well Bottom (ft) 35.30

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~25.00 - 35.00~~ 23.94-33.94 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 30.00

Pump Start Time: 0735

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 27.40

APTIM

Sample Collection Log

Location ID: 16WW22				Sample No: 16WW22-191022						
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
10/22/19	0740	100	.5	27.49	4.04	16.48	6.58	77.3	25	1.03
	0745	100	1.0	27.55	4.03	17.32	6.32	55.4	26	0.79
	0750	100	1.5	27.59	4.03	17.57	6.31	41.9	27	0.55
	0755	100	2.0	27.62	4.04	17.65	6.30	41.5	28	0.54
	0800	100	2.5	27.64	4.04	17.69	6.30	40.8	29	0.53
	0805	100	3.0	27.65	4.04	17.73	6.30	40.5	29	0.52

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW22**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cold / Sunny

SAMPLING INFORMATION

Sample No: 16WW22-191022-MS **DATE/TIME:** 10/22/19 0723 **Pump Inlet Depth:** 30.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 0735

Depth to Water - Initial (DTWi) (ft) 27.40

Purge End Date/Time: 10/22/19 0805

Depth to Well Bottom (ft) 35.30

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~25.00 - 35.00~~ 23.94-33.94 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 30.00

Pump Start Time: 0735

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW22				Sample No: 16WW22-191022-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
10/22/19	0740	100	.5	27.49	4.04	16.48	6.58	77.3	25	1.03
	0745	100	1.0	27.55	4.03	17.32	6.32	55.4	26	0.79
	0750	100	1.5	27.59	4.03	17.57	6.31	41.9	27	0.55
	0755	100	2.0	27.62	4.04	17.65	6.30	41.5	28	0.54
	0800	100	2.5	27.64	4.04	17.69	6.30	40.8	29	0.53
	0805	100	3.0	27.65	4.04	17.73	6.30	40.5	29	0.52

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW22**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS COLD / SUNNY

SAMPLING INFORMATION

Sample No: 16WW22-1910 22-MSD **DATE/TIME:** 10/22/19 0723 **Pump Inlet Depth:** 30.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 10/22/19 0735

Depth to Water - Initial (DTWi) (ft) 27.40

Purge End Date/Time: 10/22/19 0805

Depth to Well Bottom (ft) 35.30

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~25.00 - 35.00~~ 23.94-33.94 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 30.00

Pump Start Time: 0735

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW22 Sample No: 16WW22-1910_22_-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
10/22/19	0740	100	.5	27.49	4.04	16.48	6.58	77.3	25	1.03
	0745	100	1.0	27.55	4.03	17.32	6.32	55.4	26	0.79
	0750	100	1.5	27.59	4.03	17.57	6.31	41.9	27	0.55
	0755	100	2.0	27.62	4.04	17.65	6.30	41.5	28	0.54
	0800	100	2.5	27.64	4.04	17.69	6.30	40.8	29	0.53
	0805	100	3.0	27.65	4.04	17.73	6.30	40.5	29	0.52

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW39**

Sampler(s): Scott Bessinger

FIELD CONDITIONS COLD / SUNNY

SAMPLING INFORMATION

Sample No: 16WW39-191022 **DATE/TIME:** 10/22/19 0912 **Pump Inlet Depth:** 24.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Casing ID (in.): 2"

Depth to Water - Initial (DTWi) (ft) 20.08

Depth to Well Bottom (ft) 29.40

Screen Interval (ft): ~~19.00 - 24.00~~ 18-28 FT BTOC

L George 05/20/2020

Approximate depth of pump inlet*(ft): 24.00

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: Low flow/BLADDER PUMP

Purge Start Date/Time: 10/22/19 0920

Purge End Date/Time: 10/22/19 0950

Discharge Tube Length: NA PID Reading: NA

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

Pump Start Time: 0920

2ND DEPTH TO WATER -

APTIM

Sample Collection Log

Location ID: 16WW39 Sample No: 16WW39-1910 22

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
10/22/19	0925	100	.5	20.16	5.76	15.74	6.30	25.2	84	0.93
	0930	100	1.0	20.21	5.78	16.75	6.15	14.9	54	0.31
	0935	100	1.5	20.25	5.77	16.80	6.15	9.8	55	0.22
	0940	100	2.0	20.28	5.77	16.87	6.14	8.7	56	0.21
	0945	100	2.5	20.30	5.77	16.93	6.14	7.8	56	0.21
	0950	100	3.0	20.32	5.77	16.99	6.14	7.1	57	0.20

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW40**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Clear / Sunny

SAMPLING INFORMATION

Sample No: 16WW40-1910 22

DATE/TIME: 10/22/19

Pump Inlet Depth: 16.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SW9060	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : TOC

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 10/22/19 1240

Depth to Water - Initial (DTWi) (ft) 11.22

Purge End Date/Time: 10/22/19 1310

Depth to Well Bottom (ft) 17.50

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~13.8 - 23.8~~ 10.8-20.8 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 16.00

Pump Start Time: 1240

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 11.22

APTIM

Sample Collection Log

Location ID: 16WW40				Sample No: 16WW40-191022						
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
10/22/19	1245	100	.5	11.30	6.73	20.06	5.95	66.3	7	0.73
	1250	100	1.0	11.36	6.80	20.55	5.88	48.7	-35	0.24
	1255	100	1.5	11.40	6.81	20.63	5.93	43.0	-54	0.04
	1300	100	2.0	11.43	6.82	20.70	5.94	42.7	-55	0.04
	1305	100	2.5	11.45	6.83	20.78	5.95	41.9	-56	0.03
	1310	100	3.0	11.46	6.83	20.84	5.95	41.4	-56	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Location ID: 16EW01 Sample No: 16EW01-1911 11

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
11-11-19	1212	150	1.0	24.75	6.124	19.16	6.46	6.8	-1.1	1.90
11-11-19	1217	150	1.75	24.75	6.439	19.18	6.11	4.8	-18.8	0.88
11-11-19	1222	150	2.50	24.75	6.449	19.17	6.14	3.8	-20.5	0.74
11-11-19	1227	150	3.25	24.75	6.511	19.19	6.14	3.0	-22.4	0.68
11-11-19	1232	150	4.00	24.75	6.517	19.18	6.12	2.0	-23.5	0.57
11-11-19	1237	150	4.75	24.75	6.521	19.18	6.12	1.7	-23.9	0.55
11-11-19	1242	150	5.5	24.75	6.525	19.19	6.12	1.3	-23.9	0.55
11-11-19	Sample									

Logged by: [illegible] Date: 11-11-19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Location ID: 16EW02 Sample No: 16EW02-1911//

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
11-11-19	1435	200	1	22.50	5.671	19.08	6.35	0.0	29.9	2.93
11-11-19	1440	200	2	22.50	5.798	19.07	6.01	0.0	59.2	1.01
11-11-19	1445	200	3	22.50	5.880	19.07	5.97	0.0	60.1	0.98
11-11-19	1450	200	4	22.50	5.871	19.09	5.96	0.0	64.2	0.97
11-11-19	1455	200	5	22.50	5.865	19.10	5.95	0.0	70.9	0.95
11-11-19	Sample									

Logged by: [signature] Date: 11-11-19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Location ID: 16EW03 Sample No: 16EW03-1911 11

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
11-11-19	1558	180	1.0	12.30	7.906	19.60	6.13	22.0	-59.0	1.79
11-11-19	1403	180	1.9	12.30	8.014	19.68	6.18	7.1	-101.1	0.56
11-11-19	1408	180	2.8	12.30	8.024	19.73	6.20	0.0	-106.1	0.43
11-11-19	1413	180	3.7	12.30	8.025	19.75	6.20	0.0	-108.1	0.40
11-11-19	1418	180	4.6	12.30	8.031	19.74	6.21	0.0	-110.1	0.39
11-11-19	Sample									

Logged by: [signature] Date: 11-11-19

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Location ID: 16EW04 Sample No: 16EW04-1911_11

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
11-11-19	1308	200	1.0	7.65	6.162	17.49	6.21	14.8	95.8	2.37
11-11-19	1313	200	2.0	7.65	6.300	18.91	5.48	9.7	119.1	0.71
11-11-19	1318	200	3.0	7.65	6.312	18.82	5.46	7.3	122.0	0.59
11-11-19	1323	200	4.0	7.65	6.325	18.47	5.46	7.2	126.2	0.58
11-11-19	1328	200	5.0	7.65	6.326	18.49	5.46	6.5	127.2	0.57
11-11-19	1333	200	6.0	7.65	6.323	18.50	5.46	5.8	128.3	0.57
11-11-19	Sample									

Logged by: [signature] Date: 11-11-19

QC'd by: _____ Date: _____

+FD

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16IW09**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16IW09-1911_19 **DATE/TIME:** 11/19/19 1145 **Pump Inlet Depth:** 17.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 11/19/19 1155

Depth to Water - Initial (DTWi) (ft) 11.78

Purge End Date/Time: 11/19/19 1225

Depth to Well Bottom (ft) 22.25

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~12.00 - 22.00~~ 11.33-21.33 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 17.00

Pump Start Time: 1155

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 11.78

APTIM

Sample Collection Log

Location ID: 16IW09 Sample No: 16IW09-1911 19

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
11/19/19	1200	100	.5	11.85	1.38	20.52	5.57	0.0	-106	1.02
	1205	100	1.0	11.91	1.34	20.55	5.18	0.0	-100	0.27
	1210	100	1.5	11.95	1.23	20.60	4.98	0.0	-91	0.05
	1215	100	2.0	11.98	1.22	20.63	4.97	0.0	-90	0.05
	1220	100	2.5	12.00	1.21	20.68	4.96	0.0	-89	0.05
	1225	100	3.0	12.02	1.21	20.72	4.96	0.0	-88	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16IW10**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

CLEAR

SAMPLING INFORMATION

Sample No: 16IW10-1911 20

DATE/TIME: 11/20/19 1012

Pump Inlet Depth: 23.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow /BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 11/20/19 1025

Depth to Water - Initial (DTWi) (ft) 22.45

Purge End Date/Time: 11/20/19 1055

Depth to Well Bottom (ft) 28.50

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~18.00 - 28.00~~ 18.21-28.21 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): _____

Pump Start Time: 1025

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 22.45

APTIM

Sample Collection Log

Location ID: 16IW10				Sample No: 16IW10-1911 20						
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
11/20/19	1030	100	.5	22.52	6.30	18.67	6.42	1000	-13	0.94
	1035	100	1.0	22.57	6.24	19.20	6.22	1000	-25	0.22
	1040	100	1.5	22.61	6.12	19.42	6.21	1000	-44	0.06
	1045	100	2.0	22.63	6.11	19.50	6.20	1000	-45	0.06
	1050	100	2.5	22.65	6.10	19.58	6.20	1000	-46	0.06
	1055	100	3.0	22.67	6.10	19.67	6.20	1000	-47	0.05

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW01**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR/ COLD

SAMPLING INFORMATION

Sample No: 16RW01-191119 **DATE/TIME:** 11/19/19 0640 **Pump Inlet Depth:** 23.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 0655

Depth to Water - Initial (DTWi) (ft) 17.45

Purge End Date/Time: 11/19/19 0725

Depth to Well Bottom (ft) 28.28

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~18.00 - 28.00~~ 18.21-28.21 FT BTOC

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 23.00

Pump Start Time: 0655

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.45

APTIM

Sample Collection Log

Location ID: 16RW01	Sample No: 16RW01-191119									
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
11/19/19	0700	100	.5	17.52	2.42	13.09	4.82	17.3	298	0.93
	0705	100	1.0	17.58	2.24	16.75	4.90	7.4	301	0.40
	0710	100	1.5	17.62	2.23	16.97	4.91	2.9	302	0.20
	0715	100	2.0	17.65	2.22	17.08	4.92	1.0	302	0.20
	0720	100	2.5	17.67	2.22	17.16	4.93	0.5	303	0.19
	0725	100	3.0	17.68	2.22	17.21	4.93	0.0	303	0.19

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW02**

Project No: **501032**

Sampler(s): Scott Bleesinger

FIELD CONDITIONS

CLEAR

SAMPLING INFORMATION

Sample No: 16RW02-191119

DATE/TIME: 11/19/19 1008

Pump Inlet Depth: 16.25

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 1015

Depth to Water - Initial (DTWi) (ft) 12.60

Purge End Date/Time: 11/19/19 1045

Depth to Well Bottom (ft) 21.50

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~11.25-21.25~~ 11.03-21.06 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 16.25

Pump Start Time: 1015

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 12.60

APTIM

Sample Collection Log

Location ID: 16RW02 Sample No: 16RW02-191119

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
11/19/19	1020	100	.5	12.68	0.294	17.93	6.31	12.2	-33	0.79
	1025	100	1.0	12.73	0.157	18.80	5.84	10.5	-18	0.21
	1030	100	1.5	12.77	0.147	18.97	5.75	9.7	-17	0.04
	1035	100	2.0	12.79	0.146	19.09	5.74	8.9	-16	0.04
	1040	100	2.5	12.81	0.146	19.18	5.74	8.0	-15	0.03
↓	1045	100	3.0	12.82	0.146	19.28	5.73	7.5	-15	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW03**

Project No: **501032**

Sampler(s): Scott Bussinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16RW03-191119 **DATE/TIME:** 11/19/19 1053 **Pump Inlet Depth:** 17.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 1105

Depth to Water - Initial (DTWi) (ft) 12.20

Purge End Date/Time: 11/19/19 1135

Depth to Well Bottom (ft) 23.05

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~12.90 - 22.90~~ 13.34-23.34 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 17.90

Pump Start Time: 1105

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 12.20

APTIM

Sample Collection Log

Location ID: 16RW03 Sample No: 16RW03-191119

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
11/19/19	1110	100	.5	12.28	0.572	19.73	5.83	29.3	73	0.95
	1115	100	1.0	12.33	0.593	19.95	5.77	28.5	79	0.48
	1120	100	1.5	12.37	0.587	20.00	5.75	28.2	83	0.48
	1125	100	2.0	12.39	0.586	20.05	5.74	28.0	84	0.48
	1130	100	2.5	12.40	0.586	20.09	5.74	27.6	85	0.49
	1135	100	3.0	12.41	0.586	20.14	5.74	27.3	85	0.49

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW04**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS

Clear/cold

SAMPLING INFORMATION

Sample No: 16RW04-191119

DATE/TIME: 11/19/19 0735

Pump Inlet Depth: 19.45

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 0745

Depth to Water - Initial (DTWi) (ft) 18.93

Purge End Date/Time: 11/19/19 0815

Depth to Well Bottom (ft) 27.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~14.45 - 24.45~~ 16.9-26.9 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 19.45

Pump Start Time: 0745

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 18.93

APTIM

Sample Collection Log

Location ID: 16RW04 Sample No: 16RW04-191119

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
11/19/19	0750	100	.5	18.99	1.72	14.55	5.09	15.8	249	0.98
	0755	100	1.0	19.05	1.71	15.74	5.01	9.9	233	0.38
	0800	100	1.5	19.10	1.71	16.19	5.01	9.0	230	0.13
	0805	100	2.0	19.13	1.71	16.29	5.01	8.1	229	0.13
	0810	100	2.5	19.15	1.71	16.35	5.01	7.0	229	0.12
	0815	100	3.0	19.17	1.71	16.42	5.01	6.1	228	0.12

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW04**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Clear / Cold

SAMPLING INFORMATION

Sample No: 16RW04-1911 19 -FD

DATE/TIME: 11/19/19 0735

Pump Inlet Depth: 19.45

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 0745

Depth to Water - Initial (DTWi) (ft) 18.93

Purge End Date/Time: 11/19/19 0815

Depth to Well Bottom (ft) 27.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~14.45 - 24.45~~ 16.9-26.9 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 19.45

Pump Start Time: 0745

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16RW04				Sample No: 16RW04-191119-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
11/19/19	0750	100	.5	18.99	1.72	14.55	5.09	15.8	249	0.98
	0755	100	1.0	19.05	1.71	15.74	5.01	9.9	233	0.38
	0800	100	1.5	19.10	1.71	16.19	5.01	9.0	230	0.13
	0805	100	2.0	19.13	1.71	16.29	5.01	8.1	229	0.13
	0810	100	2.5	19.15	1.71	16.35	5.01	7.0	229	0.12
	0815	100	3.0	19.17	1.71	16.42	5.01	6.1	228	0.12

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW05**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS CLEAR / COOL

SAMPLING INFORMATION

Sample No: 16RW05-191119

DATE/TIME: 11/19/19 0920

Pump Inlet Depth: 18.20

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 0930

Depth to Water - Initial (DTWi) (ft) 12.78

Purge End Date/Time: 11/19/19 1000

Depth to Well Bottom (ft) 23.40

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~13.20 - 23.20~~ 13.09-23.09 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 18.20

Pump Start Time: 0930

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 12.78

APTIM

Sample Collection Log

Location ID: 16RW05					Sample No: 16RW05-1911 19					
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
11/19/19	0935	100	.5	12.85	3.14	17.30	5.96	0.0	-65	0.87
	0940	100	1.0	12.91	3.22	17.80	6.14	0.0	-186	0.24
	0945	100	1.5	12.95	3.27	18.07	6.15	0.0	-175	0.06
	0950	100	2.0	12.97	3.28	18.18	6.15	0.0	-176	0.05
	0955	100	2.5	12.99	3.28	18.27	6.16	0.0	-177	0.05
	1000	100	3.0	13.00	3.28	18.34	6.16	0.0	-178	0.05

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW06**

Project No: **501032**

Sampler(s): Scott Bussinger

FIELD CONDITIONS

Clear/cold

SAMPLING INFORMATION

Sample No: 16RW06-191120

DATE/TIME: 11/20/19 0733

Pump Inlet Depth: 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 0750

Depth to Water - Initial (DTWi) (ft) 24.08

Purge End Date/Time: 11/20/19 0820

Depth to Well Bottom (ft) 29.25

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~18.75 - 28.75~~ 18.52-28.52 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 0750

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water - 24.08

APTIM

Sample Collection Log

Location ID: 16RW06 Sample No: 16RW06-1911 20

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
11/20/19	0755	100	.5	24.15	5.00	14.25	5.28	36.5	223	0.93
	0800	100	1.0	24.21	5.10	14.98	5.83	27.4	158	0.33
	0805	100	1.5	24.25	5.15	15.17	6.00	24.8	143	0.07
	0810	100	2.0	24.28	5.16	15.25	6.01	24.2	142	0.06
	0815	100	2.5	24.30	5.17	15.33	6.01	23.6	141	0.06
	0820	100	3.0	24.32	5.17	15.39	6.02	23.0	140	0.06

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW06**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS

CLEAR/COLD

SAMPLING INFORMATION

Sample No: 16RW06-1911 20 -FD **DATE/TIME:** 11/20/19 0733 **Pump Inlet Depth:** 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 0750

Depth to Water - Initial (DTWi) (ft) 24.08

Purge End Date/Time: 11/20/19 0820

Depth to Well Bottom (ft) 29.25

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~18.75 - 28.75~~ 18.52-28.52 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 0750

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16RW06 Sample No: 16RW06-1911 20 -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
11/20/19	0755	100	.5	24.15	5.00	14.25	5.28	36.5	223	0.93
	0800	100	1.0	24.21	5.10	14.98	5.83	27.4	158	0.33
	0805	100	1.5	24.25	5.15	15.17	6.00	24.8	143	0.07
	0810	100	2.0	24.28	5.16	15.25	6.01	24.2	142	0.06
	0815	100	2.5	24.30	5.17	15.33	6.01	23.6	141	0.06
✓	0820	100	3.0	24.32	5.17	15.39	6.02	23.0	140	0.06

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW07**

Project No: **501032**

Sampler(s): Scott Dressinger

FIELD CONDITIONS

Clear / cold

SAMPLING INFORMATION

Sample No: 16RW07-191120

DATE/TIME: 11/20/19 0830

Pump Inlet Depth: 24.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 0845

Depth to Water - Initial (DTWi) (ft) 22.00

Purge End Date/Time: 11/20/19 0915

Depth to Well Bottom (ft) 29.45

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~19.00 - 29.00~~ 18.28-28.28 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 24.00

Pump Start Time: 0845

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 22.00

APTIM

Sample Collection Log

Location ID: 16RW07	Sample No: 16RW07-191120									
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
11/20/19	0850	100	.5	22.08	3.82	17.33	6.13	37.7	83	1.02
	0855	100	1.0	22.12	3.88	18.30	6.12	33.2	61	0.25
	0900	100	1.5	22.15	4.04	18.59	6.13	31.7	45	0.04
	0905	100	2.0	22.17	4.05	18.67	6.14	31.1	44	0.04
	0910	100	2.5	22.19	4.06	18.75	6.14	30.8	44	0.03
	0915	100	3.0	22.20	4.06	18.84	6.14	30.4	43	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW08**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Clear / cool

SAMPLING INFORMATION

Sample No: 16RW08-191120 **DATE/TIME:** 11/20/19 **Pump Inlet Depth:** 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 0935

Depth to Water - Initial (DTWi) (ft) 23.02

Purge End Date/Time: 11/20/19 1005

Depth to Well Bottom (ft) 30.52

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00 - 30.00~~ 19.25-29.25 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 0935

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 23.02

APTIM

Sample Collection Log

Location ID: 16RW08					Sample No: 16RW08-191120					
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
11/20/19	0940	100	.5	23.10	4.84	17.66	6.28	36.5	84	0.88
	0945	100	1.0	23.16	4.85	18.95	6.30	34.2	89	0.29
	0950	100	1.5	23.20	4.92	19.08	6.33	32.7	89	0.05
	0955	100	2.0	23.23	4.93	19.15	6.34	32.2	89	0.05
	1000	100	2.5	23.25	4.93	19.20	6.35	31.6	90	0.04
✓	1005	100	3.0	23.26	4.94	19.25	6.35	31.2	90	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW09**

Project No: **501032**

Sampler(s): Scott Bessinger

FIELD CONDITIONS

Clear

SAMPLING INFORMATION

Sample No: 16RW09-1911 20

DATE/TIME: 11/20/19 1004

Pump Inlet Depth: 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 1115

Depth to Water - Initial (DTWi) (ft) 24.70

Purge End Date/Time: 11/20/19 1145

Depth to Well Bottom (ft) 30.63

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00 - 30.00~~ 19.67-29.67 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 1115

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water - 24.70

APTIM

Sample Collection Log

Location ID: 16RW09					Sample No: 16RW09-191120					
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
11/20/19	1120	100	.5	24.77	4.34	20.37	6.28	22.3	67	0.97
	1125	100	1.0	24.82	4.28	20.60	6.16	19.7	102	0.43
	1130	100	1.5	24.86	4.28	20.82	6.16	18.5	122	0.23
	1135	100	2.0	24.89	4.27	20.90	6.17	18.1	123	0.22
	1140	100	2.5	24.91	4.27	20.96	6.17	17.6	123	0.21
	1145	100	3.0	24.93	4.27	21.01	6.17	17.3	124	0.21

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW10**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Clear

SAMPLING INFORMATION

Sample No: 16RW10-1911 20

DATE/TIME: 11/20/19 1155

Pump Inlet Depth: 22.80

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 1205

Depth to Water - Initial (DTWi) (ft) 22.02

Purge End Date/Time: 11/20/19 1240

Depth to Well Bottom (ft) 28.22

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.80-27.80~~ 17.98-27.98 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 22.80

Pump Start Time: 1205

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 22.02

APTIM

Sample Collection Log

Location ID: 16RW10	Sample No: 16RW10-191120									
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
11/20/19	1210	100	.5	22.10	5.19	20.81	6.24	31.3	126	1.06
	1215	100	1.0	22.15	5.29	20.18	6.25	22.2	93	0.48
	1220	100	1.5	22.19	5.35	20.05	6.25	17.5	80	0.21
	1225	100	2.0	22.22	5.38	19.97	6.25	15.0	82	0.04
	1230	100	2.5	22.24	5.38	19.91	6.26	14.6	83	0.03
	1235	100	3.0	22.25	5.39	19.85	6.26	14.2	84	0.03
	1240	100	3.5	22.25	5.39	19.80	6.26	13.9	85	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW10**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS

Clear

SAMPLING INFORMATION

Sample No: 16RW10-1911 20 -MS **DATE/TIME:** 11/20/19 1155 **Pump Inlet Depth:** 22.80

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 1205

Depth to Water - Initial (DTWi) (ft) 22.02

Purge End Date/Time: 11/20/19 1240

Depth to Well Bottom (ft) 28.22

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.90 - 27.80~~ 17.98-27.98 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 22.80

Pump Start Time: 1205

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16RW10 Sample No: 16RW10-1911_20-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
11/20/19	1210	100	.5	22.10	5.19	20.81	6.24	31.3	126	1.06
	1215	100	1.0	22.15	5.29	20.18	6.25	22.2	93	0.48
	1220	100	1.5	22.19	5.35	20.05	6.25	17.5	80	0.21
	1225	100	2.0	22.22	5.38	19.97	6.25	15.0	82	0.04
	1230	100	2.5	22.24	5.38	19.91	6.26	14.6	83	0.03
	1235	100	3.0	22.25	5.39	19.85	6.26	14.2	84	0.03
	1240	100	3.5	22.25	5.39	19.80	6.26	13.9	85	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16RW10**

Project No: **501032**

Sampler(s): Scott Baessinger

FIELD CONDITIONS

CLEAR

SAMPLING INFORMATION

Sample No: 16RW10-1911 20-MSD **DATE/TIME:** 11/20/19 1155 **Pump Inlet Depth:** 22.80

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/20/19 1205

Depth to Water - Initial (DTWi) (ft) 22.02

Purge End Date/Time: 11/20/19 1240

Depth to Well Bottom (ft) 28.22

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.80 - 27.80~~ 17.98-27.98 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 22.80

Pump Start Time: 1205

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16RW10 Sample No: 16RW10-1911 20 -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
11/20/19	1210	100	.5	22.10	5.19	20.81	6.24	31.3	126	1.06
	1215	100	1.0	22.15	5.29	20.18	6.25	22.2	93	0.48
	1220	100	1.5	22.19	5.35	20.05	6.25	17.5	80	0.21
	1225	100	2.0	22.22	5.38	19.97	6.25	15.0	82	0.04
	1230	100	2.5	22.24	5.38	19.91	6.26	14.6	83	0.03
	1235	100	3.0	22.25	5.39	19.85	6.26	14.2	84	0.03
	1240	100	3.5	22.25	5.39	19.80	6.26	13.9	85	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW26**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR / COLD

SAMPLING INFORMATION

Sample No: 16WW26-1911 19 **DATE/TIME:** 11/19/19 0826 **Pump Inlet Depth:** 19.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 0840

Depth to Water - Initial (DTWi) (ft) 16.55

Purge End Date/Time: 11/19/19 0910

Depth to Well Bottom (ft) 21.80

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~16.50 - 21.50~~ 15.97-20.97 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 19.00

Pump Start Time: 0840

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 16.55

APTIM

Sample Collection Log

Location ID: 16WW26 Sample No: 16WW26-1911 19

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
11/19/19	0845	100	.5	16.62	1.25	16.18	5.22	30.1	115	1.01
	0850	100	1.0	16.67	1.11	17.60	5.26	30.6	96	0.31
	0855	100	1.5	16.70	1.10	17.79	5.28	10.3	96	0.19
	0900	100	2.0	16.72	1.09	17.88	5.29	9.5	95	0.19
	0905	100	2.5	16.74	1.09	17.95	5.29	8.9	95	0.18
	0910	100	3.0	16.75	1.09	18.04	5.29	8.3	95	0.18

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW42**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS Clear

SAMPLING INFORMATION

Sample No: 16WW42-1911 19 **DATE/TIME:** 11/19/19 1236 **Pump Inlet Depth:** 9.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 1245

Depth to Water - Initial (DTWi) (ft) 9.19

Purge End Date/Time: 11/19/19 1320

Depth to Well Bottom (ft) 15.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~4.90 - 14.90~~ 6.57-16.57 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 9.90

Pump Start Time: 1245

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 9.19

APTIM

Sample Collection Log

Location ID: 16WW42				Sample No: 16WW42-1911 19						
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
11/19/19	1250	100	.5	9.27	2.03	22.11	5.49	281	-27	0.99
	1255	100	1.0	9.33	1.92	22.25	5.62	250	-29	1.22
	1300	100	1.5	9.37	1.83	22.30	5.66	215	12	1.29
	1305	100	2.0	9.39	0.607	22.37	5.60	209	45	1.33
	1310	100	2.5	9.40	0.607	22.43	5.59	208	46	1.35
	1315	100	3.0	9.41	0.606	22.48	5.58	207	47	1.36
	1320	100	3.5	9.41	0.606	22.53	5.58	206	48	1.37

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW42**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS

Clear

SAMPLING INFORMATION

Sample No: 16WW42-1911 19-MS **DATE/TIME:** 11/19/19 1236 **Pump Inlet Depth:** 9.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 1245

Depth to Water - Initial (DTWi) (ft) 9.19

Purge End Date/Time: 11/19/19 1320

Depth to Well Bottom (ft) 15.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~4.90 - 14.90~~ 6.57-16.57 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 9.90

Pump Start Time: 1245

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW42	Sample No: 16WW42-191119-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
11/19/19	1250	100	.5	9.27	2.03	22.11	5.49	281	-27	0.99
	1255	100	1.0	9.33	1.92	22.25	5.62	250	-29	1.22
	1300	100	1.5	9.37	1.23	22.30	5.66	215	12	1.29
	1305	100	2.0	9.39	0.607	22.37	5.60	209	45	1.33
	1310	100	2.5	9.40	0.607	22.43	5.59	208	46	1.35
	1315	100	3.0	9.41	0.606	22.48	5.58	207	47	1.36
	1320	100	3.5	9.41	0.606	22.53	5.58	206	48	1.37

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW42**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Clear

SAMPLING INFORMATION

Sample No: 16WW42-191119-MSD **DATE/TIME:** 11/19/19 1236 **Pump Inlet Depth:** 9.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 11/19/19 1245

Depth to Water - Initial (DTWi) (ft) 9.19

Purge End Date/Time: 11/19/19 1320

Depth to Well Bottom (ft) 15.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~4.90 - 14.90~~ 6.57-16.57 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/21/2020

Approximate depth of pump inlet*(ft): 9.90

Pump Start Time: 1245

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW42				Sample No: 16WW42-191119-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
11/19/19	1250	100	.5	9.27	2.03	22.11	5.49	281	-27	0.99
	1255	100	1.0	9.33	1.92	22.25	5.62	250	-29	1.22
	1300	100	1.5	9.37	1.23	22.30	5.66	215	12	1.29
	1305	100	2.0	9.39	0.607	22.37	5.60	209	45	1.33
	1310	100	2.5	9.40	0.607	22.43	5.59	208	46	1.35
	1315	100	3.0	9.41	0.606	22.48	5.58	207	47	1.36
	1320	100	3.5	9.41	0.606	22.53	5.58	206	48	1.37

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW05**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS

CLEAR / COLD

SAMPLING INFORMATION

Sample No: 16EW05-E2-191223

DATE/TIME: 12/23/19 0743

Pump Inlet Depth: 49.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0800

Depth to Water - Initial (DTWi) (ft) 6.10

Purge End Date/Time: 12/23/19 0830

Depth to Well Bottom (ft) 51.77

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~47.00 - 52.00~~ 46.43-51.43 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 49.50

Pump Start Time: 0800

Ferrous Iron (Required Y or N) N mg/L

2ND DEPTH TO WATER - 6.10

APTIM

Sample Collection Log

Location ID: 16EW05					Sample No: 16EW05-E2-19/1223					
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
12/23/19	0805	100	.5	6.15	4.16	16.55	5.39	1000	-31	0.77
	0810	100	1.0	6.20	3.65	17.63	5.34	1000	-33	0.25
	0815	100	1.5	6.24	3.64	17.65	5.34	1000	-30	0.08
	0820	100	2.0	6.27	3.63	17.67	5.33	1000	-30	0.08
	0825	100	2.5	6.29	3.63	17.69	5.33	1000	-29	0.07
	0830	100	3.0	6.30	3.63	17.70	5.33	1000	-29	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW06**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS CLEAR/COLD

SAMPLING INFORMATION

Sample No: 16EW06-E2-191223 **DATE/TIME:** 12/23/19 0839 **Pump Inlet Depth:** 52.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0855

Depth to Water - Initial (DTWi) (ft) 21.12

Purge End Date/Time: 12/23/19 0925

Depth to Well Bottom (ft) 55.88

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~50.00 - 55.00~~ 49.72-54.72 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y/N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 52.50

Pump Start Time: 0925

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 21.12

APTIM

Sample Collection Log

Location ID: 16EW06				Sample No: 16EW06-E2-191223						
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
12/23/19	0900	100	.5	21.19	3.34	11.27	5.26	1000	-19	0.73
	0905	100	1.0	21.25	3.52	11.83	5.26	1000	-30	0.22
	0910	100	1.5	21.29	3.51	12.05	5.26	1000	-31	0.05
	0915	100	2.0	21.32	3.50	12.12	5.25	1000	-32	0.05
	0920	100	2.5	21.34	3.50	12.20	5.25	1000	-33	0.04
	0925	100	3.0	21.36	3.50	12.27	5.25	1000	-33	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW06**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS

CLEAR / COLD

SAMPLING INFORMATION

Sample No: 16EW06-E2-19~~1223~~-FD **DATE/TIME:** 12/23/19 0839 **Pump Inlet Depth:** 52.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0855

Depth to Water - Initial (DTWi) (ft) 21.12

Purge End Date/Time: 12/23/19 0925

Depth to Well Bottom (ft) 55.88

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~50.00 - 55.00~~ 49.72-54.72 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 52.50

Pump Start Time: 0855

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16EW06	Sample No: 16EW06-E2-191223FD									
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
12/23/19	0900	100	.5	21.19	3.34	11.27	5.26	1000	-19	0.73
	0905	100	1.0	21.25	3.52	11.83	5.26	1000	-30	0.22
	0910	100	1.5	21.29	3.51	12.05	5.26	1000	-31	0.05
	0915	100	2.0	21.32	3.50	12.12	5.25	1000	-32	0.05
	0920	100	2.5	21.34	3.50	12.20	5.25	1000	-33	0.04
	0925	100	3.0	21.36	3.50	12.27	5.25	1000	-33	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW07**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS CLEAR/COOL

SAMPLING INFORMATION

Sample No: 16EW07-E2-191223 **DATE/TIME:** 12/23/19 0937 **Pump Inlet Depth:** 43.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0950

Depth to Water - Initial (DTWi) (ft) 12.27

Purge End Date/Time: 12/23/19 1020

Depth to Well Bottom (ft) 46.70

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 41.00-46.00 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 43.50

Pump Start Time: 0950

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 12.27

APTIM

Sample Collection Log

Location ID: 16EW07 Sample No: 16EW07-E2-191223										
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
12/23/19	0955	100	.5	12.35	3.59	11.59	5.23	1000	-2	0.68
	1000	100	1.0	12.40	3.43	12.08	5.17	1000	-13	0.19
	1005	100	1.5	12.44	3.40	12.48	5.18	1000	-16	0.03
	1010	100	2.0	12.47	3.40	12.55	5.19	1000	-17	0.03
	1015	100	2.5	12.49	3.39	12.61	5.19	1000	-17	0.02
	1020	100	3.0	12.51	3.39	12.66	5.19	1000	-18	0.02

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW07**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Clear/cool

SAMPLING INFORMATION

Sample No: 16EW07-E2-19/223-MS **DATE/TIME:** 12/23/19 0937 **Pump Inlet Depth:** 43.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0950

Depth to Water - Initial (DTWi) (ft) 12.27

Purge End Date/Time: 12/23/19 1020

Depth to Well Bottom (ft) 46.70

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 41.00 - 46.00 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 43.50

Pump Start Time: 0950

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16EW07	Sample No: 16EW07-E2-191223-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
12/23/19	0955	100	.5	12.35	3.59	11.59	5.23	1000	-2	0.68
	1000	100	1.0	12.40	3.43	12.08	5.17	1000	-13	0.19
	1005	100	1.5	12.44	3.40	12.48	5.18	1000	-16	0.03
	1010	100	2.0	12.47	3.40	12.55	5.19	1000	-17	0.03
	1015	100	2.5	12.49	3.39	12.61	5.19	1000	-17	0.02
	1020	100	3.0	12.51	3.39	12.66	5.19	1000	-18	0.02

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW07**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Clear / Cool

SAMPLING INFORMATION

Sample No: 16EW07-E2-19 1223MSD **DATE/TIME:** 12/23/19 0937 **Pump Inlet Depth:** 43.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310C	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 0950

Depth to Water - Initial (DTWi) (ft) 12.27

Purge End Date/Time: 12/23/19 1020

Depth to Well Bottom (ft) 46.70

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 41.00 - 46.00 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 43.50

Pump Start Time: 0950

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16EW07	Sample No: 16EW07-E2-19/1223-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
12/23/19	0955	100	.5	12.35	3.59	11.59	5.23	1000	-2	0.68
	1000	100	1.0	12.40	3.43	12.08	5.17	1000	-13	0.19
	1005	100	1.5	12.44	3.40	12.48	5.18	1000	-16	0.03
	1010	100	2.0	12.47	3.40	12.55	5.19	1000	-17	0.03
	1015	100	2.5	12.49	3.39	12.61	5.19	1000	-17	0.02
	1020	100	3.0	12.51	3.39	12.66	5.19	1000	-18	0.02

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW08**

Project No: **501032**

Sampler(s): Scott Bassinger

FIELD CONDITIONS

Clear/cool

SAMPLING INFORMATION

Sample No: 16EW08-E2-191223

DATE/TIME: 12/23/19 1030

Pump Inlet Depth: 36.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 12/23/19 1100

Depth to Water - Initial (DTWi) (ft) 7.00

Purge End Date/Time: 12/23/19 1130

Depth to Well Bottom (ft) 38.55

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~34.00-39.00~~ 33.76-38.76 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 36.50

Pump Start Time: 1100

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER- 7.00

APTIM

Sample Collection Log

Location ID: 16EW08 Sample No: 16EW08-E2-19/1223										
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
12/23/19	1105	100	.5	7.07	0.622	13.04	5.30	1000	-10	0.73
	1110	100	1.0	7.12	1.39	13.60	5.23	1000	-6	0.27
	1115	100	1.5	7.16	1.39	13.67	5.22	1000	-6	0.10
	1120	100	2.0	7.19	1.40	13.75	5.21	1000	-7	0.10
	1125	100	2.5	7.21	1.40	13.82	5.20	1000	-7	0.10
	1130	100	3.0	7.23	1.40	13.88	5.20	1000	-7	0.09

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16IW03**

Sampler(s): SCOTT BRESINGER

FIELD CONDITIONS OVERCAST

SAMPLING INFORMATION

Sample No: 16IW03-200123 **DATE/TIME:** 1/23/20 1302 **Pump Inlet Depth:** 20.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1315

Depth to Water - Initial (DTWi) (ft) 14.80

Purge End Date/Time: 1/23/20 1345

Depth to Well Bottom (ft) 25.00

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~15.00-25.00~~

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 20.00

Pump Start Time: 1315

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER- 14.80

APTIM

Sample Collection Log

Location ID: 16IW03 Sample No: 16IW03-200123

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
1/23/20	1320	100	.5	14.88	1.00	15.68	7.48	90.1	-36	0.84
	1325	100	1.0	14.94	1.01	16.02	7.28	80.5	-58	0.26
	1330	100	1.5	14.98	1.00	16.29	7.26	79.0	-75	0.05
	1335	100	2.0	15.01	0.999	16.33	7.26	78.6	-76	0.05
	1340	100	2.5	15.03	0.999	16.40	7.25	77.9	-77	0.05
	1345	100	3.0	15.05	0.999	16.47	7.25	77.3	-78	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16IW04**

Sampler(s): Scott Bellsinger

FIELD CONDITIONS OVERCAST

SAMPLING INFORMATION

Sample No: 16IW04-200123 **DATE/TIME:** 1/23/20 1213 **Pump Inlet Depth:** 22.75

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1225

Depth to Water - Initial (DTWi) (ft) 16.47

Purge End Date/Time: 1/23/20 1255

Depth to Well Bottom (ft) 28.35

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.75 - 27.75~~

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.75

Pump Start Time: 1225

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 16.47

APTIM

Sample Collection Log

Location ID: 16IW04				Sample No: 16IW04-200123						
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
1/23/20	1230	100	.5	16.55	4.82	13.56	6.87	60.1	-12	0.81
	1235	100	1.0	16.61	4.90	14.01	6.97	53.2	-31	0.29
	1240	100	1.5	16.64	4.91	14.03	6.99	49.9	-36	0.07
	1245	100	2.0	16.66	4.92	14.06	7.00	49.4	-36	0.07
	1250	100	2.5	16.67	4.92	14.08	7.00	48.7	-37	0.06
	1255	100	3.0	16.68	4.92	14.10	7.00	48.2	-37	0.06

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16PM02**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS OVER CAST

SAMPLING INFORMATION

Sample No: 16PM02-200123

DATE/TIME: 1/23/20 1446

Pump Inlet Depth: _____

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow/BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1500

Depth to Water - Initial (DTWi) (ft) 17.11

Purge End Date/Time: 1/23/20 1530

Depth to Well Bottom (ft) 28.40

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~18.10 - 27.80~~ 18.1-28.1 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.95

Pump Start Time: 1500

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.11

APTIM

Sample Collection Log

Location ID: 16PM02				Sample No: 16PM02-200123						
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
1/23/20	1505	100	.5	17.18	1.35	15.29	7.60	151	24	0.82
	1510	100	1.0	17.24	1.35	16.67	7.31	144	44	0.25
	1515	100	1.5	17.28	1.36	16.74	7.17	140	50	0.09
	1520	100	2.0	17.31	1.36	16.79	7.16	139	51	0.09
	1525	100	2.5	17.33	1.37	16.83	7.16	138	52	0.08
	1530	100	3.0	17.34	1.37	16.89	7.15	137	53	0.08

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP** Location ID: **16PM03**

Project No: **501032** Sampler(s): Scott Bressinger

FIELD CONDITIONS Overcast

SAMPLING INFORMATION

Sample No: 16PM03-200123 **DATE/TIME:** 1/23/20 1536 **Pump Inlet Depth:** 23.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 2" Purge Start Date/Time: 1/23/20 1545

Depth to Water - Initial (DTWi) (ft) 16.65 Purge End Date/Time: 1/23/20 1615

Depth to Well Bottom (ft) 28.50 Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~18.00 - 28.00~~ 17.9-27.4 FT BTOC Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 23.00 Pump Start Time: 1545

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth To water - 16.65

APTIM

Sample Collection Log

Location ID: 16PM03				Sample No: 16PM03-200123						
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
1/23/20	1550	100	.5	16.72	3.37	15.39	7.02	77.3	41	0.63
	1555	100	1.0	16.77	4.21	15.77	7.04	71.2	23	0.18
	1600	100	1.5	16.81	4.34	15.88	7.05	67.9	19	0.03
	1605	100	2.0	16.83	4.34	15.95	7.06	67.4	19	0.03
	1610	100	2.5	16.85	4.35	15.99	7.06	66.8	18	0.03
	1615	100	3.0	16.86	4.35	16.03	7.06	66.5	18	0.02

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16PM06**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

OVERCAST

SAMPLING INFORMATION

Sample No: 16PM06-200123 **DATE/TIME:** 1/23/20 1122 **Pump Inlet Depth:** 22.65

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1135

Depth to Water - Initial (DTWi) (ft) 16.15

Purge End Date/Time: 1/23/20 1205

Depth to Well Bottom (ft) 27.40

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.80-27.50~~ 18.2-28.2 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.65

Pump Start Time: 1135

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 16.15

APTIM

Sample Collection Log

Location ID: 16PM06				Sample No: 16PM06-200123						
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
1/23/20	1140	100	.5	16.22	4.50	15.23	6.81	56.3	26	0.78
	1145	100	1.0	16.27	4.55	15.89	6.78	48.8	-8	0.29
	1150	100	1.5	16.31	4.54	16.38	6.83	44.0	-19	0.09
	1155	100	2.0	16.33	4.53	16.45	6.84	43.7	-20	0.09
	1200	100	2.5	16.35	4.53	16.51	6.84	43.3	-21	0.08
	1205	100	3.0	16.36	4.53	16.57	6.85	42.9	-21	0.08

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16PM06**

Sampler(s): Scott Bressinger

FIELD CONDITIONS OVERCAST

SAMPLING INFORMATION

Sample No: 16PM06-2001 23 -FD **DATE/TIME:** 1/23/20 1122 **Pump Inlet Depth:** 22.65

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1135

Depth to Water - Initial (DTWi) (ft) 16.15

Purge End Date/Time: 1/23/20 1205

Depth to Well Bottom (ft) 27.40

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.80 - 27.80~~ 18.2-28.2 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.65

Pump Start Time: 1135

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16PM06				Sample No: 16PM06-2001 23-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
1/23/20	1140	100	.5	16.22	4.50	15.23	6.81	56.3	26	0.78
	1145	100	1.0	16.27	4.55	15.89	6.78	48.8	-8	0.29
	1150	100	1.5	16.31	4.54	16.38	6.83	44.0	-19	0.09
	1155	100	2.0	16.33	4.53	16.45	6.84	43.7	-20	0.09
	1200	100	2.5	16.35	4.53	16.51	6.84	43.3	-21	0.08
	1205	100	3.0	16.36	4.53	16.57	6.85	42.9	-21	0.08

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16PM09**

Sampler(s): Scott Bressinger

FIELD CONDITIONS Overcast / Light Rain

SAMPLING INFORMATION

Sample No: 16PM09-200123 **DATE/TIME:** 1/23/20 1036 **Pump Inlet Depth:** 22.95

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1045

Depth to Water - Initial (DTWi) (ft) 14.43

Purge End Date/Time: 1/23/20 1115

Depth to Well Bottom (ft) 27.15

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.10 - 26.80~~ 16.8-26.8 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.95

Pump Start Time: 1045

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 14.43

APTIM

Sample Collection Log

Location ID: 16PM09				Sample No: 16PM09-200123						
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
1/23/20	1050	100	.5	14.50	1.10	15.33	8.06	433	127	0.69
	1055	100	1.0	14.56	1.66	16.18	7.18	415	170	0.20
	1100	100	1.5	14.60	1.84	16.45	6.85	410	173	0.04
	1105	100	2.0	14.63	1.85	16.54	6.74	409	174	0.04
	1110	100	2.5	14.65	1.86	16.62	6.73	409	175	0.03
	1115	100	3.0	14.66	1.86	16.69	6.73	408	176	0.03

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16PM14**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

OVERCAST

SAMPLING INFORMATION

Sample No: 16PM14-200123

DATE/TIME: 1/23/20 1400

Pump Inlet Depth: 20.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 1/23/20 1410

Depth to Water - Initial (DTWi) (ft) 17.60

Purge End Date/Time: 1/23/20 1440

Depth to Well Bottom (ft) 28.22

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~15.20 - 24.80~~ 18-28 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): _____

Pump Start Time: 1410

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.60

APTIM

Sample Collection Log

Location ID: 16PM14				Sample No: 16PM14-2001 23						
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
1/23/20	1415	100	.5	17.67	5.36	15.85	6.56	37.3	2	0.71
	1420	100	1.0	17.73	6.10	16.74	6.75	30.1	3	0.20
	1425	100	1.5	17.77	6.14	16.75	6.80	24.7	5	0.05
	1430	100	2.0	17.79	6.15	16.77	6.80	24.2	5	0.05
	1435	100	2.5	17.81	6.16	16.79	6.81	23.6	6	0.04
	1440	100	3.0	17.83	6.16	16.80	6.81	23.1	6	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW36**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Overcast / Light Rain

SAMPLING INFORMATION

Sample No: 16WW36-200123

DATE/TIME: 1/23/20 0928

Pump Inlet Depth: 22.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 1/23/20 0955

Depth to Water - Initial (DTWi) (ft) 17.12

Purge End Date/Time: 1/23/20 1025

Depth to Well Bottom (ft) 24.90

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~19.50 - 24.50~~ 19.49-24.49 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 22.00

Pump Start Time: 0955

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.12

APTIM

Sample Collection Log

Location ID: 16WW36				Sample No: 16WW36-2001 23						
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
1/23/20	1000	100	.5	17.20	8.50	14.89	7.20	29.1	150	0.73
	1005	100	1.0	17.24	7.97	15.83	7.15	19.7	153	0.23
	1010	100	1.5	17.31	7.71	16.19	7.15	16.8	153	0.08
	1015	100	2.0	17.34	7.70	16.28	7.14	16.3	152	0.08
	1020	100	2.5	17.36	7.69	16.35	7.15	15.7	152	0.08
	1025	100	3.0	17.38	7.69	16.42	7.14	15.2	152	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW36**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS Overcast / Light Rain

SAMPLING INFORMATION

Sample No: 16WW36-200123-MS **DATE/TIME:** 1/23/20 0928 **Pump Inlet Depth:** 22.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 1/23/20 0955

Depth to Water - Initial (DTWi) (ft) 17.12

Purge End Date/Time: 1/23/20 1025

Depth to Well Bottom (ft) 24.90

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~19.50 - 24.50~~ 19.49-24.49 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y (N)

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.00

Pump Start Time: 0955

Ferrous Iron (Required Y or (N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW36	Sample No: 16WW36-200123-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
1/23/20	1000	100	.5	17.20	8.50	14.84	7.20	29.1	150	0.73
	1005	100	1.0	17.26	7.97	15.83	7.15	19.7	153	0.23
	1010	100	1.5	17.31	7.71	16.19	7.15	16.8	153	0.08
	1015	100	2.0	17.34	7.70	16.28	7.14	16.3	152	0.08
	1020	100	2.5	17.36	7.69	16.35	7.15	15.7	152	0.08
	1025	100	3.0	17.38	7.69	16.42	7.14	15.2	152	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16WW36**

Project No: **501032**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Overcast / Light Rain

SAMPLING INFORMATION

Sample No: 16WW36-2001 23-MSD **DATE/TIME:** 1/23/20 0928 **Pump Inlet Depth:** 22.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low Flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 1/23/20 0955

Depth to Water - Initial (DTWi) (ft) 17.12

Purge End Date/Time: 1/23/20 1025

Depth to Well Bottom (ft) 24.90

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~19.50 - 24.50~~ 19.49-24.49 FT BTOC

Discharge Tube Diameter: ~~NA~~ 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.00

Pump Start Time: 0955

Ferrous Iron (Required Y or N) _____ mg/L

APTIM

Sample Collection Log

Location ID: 16WW36	Sample No: 16WW36-2001 23 -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
1/23/20	1000	100	.5	17.20	8.50	14.89	7.20	29.1	150	0.73
	1005	100	1.0	17.26	7.47	15.83	7.15	19.7	153	0.23
	1010	100	1.5	17.31	7.71	16.19	7.15	16.8	153	0.08
	1015	100	2.0	17.34	7.70	16.28	7.14	16.3	152	0.08
	1020	100	2.5	17.36	7.69	16.35	7.15	15.7	152	0.08
	1025	100	3.0	17.38	7.69	16.42	7.14	15.2	152	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16EW01**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 16EW01-200309 **DATE/TIME:** 3/9/20 0834 **Pump Inlet Depth:** 33.70

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	Alkalinity by SM2320B	1 x 250 mL HPDE	Cool 4C
		ALSHT	Anions-Nitrate,Sulfate,Bromide by 9056	1 x 250 mL HPDE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2
		MI	DHC IN WATER CENSUS	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 3/9/20 0845

Depth to Water - Initial (DTWi) (ft) 25.15

Purge End Date/Time: 3/9/20 0915

Depth to Well Bottom (ft) 39.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~31.20-36.20~~ 30.89-35.89 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 33.70

Pump Start Time: 0845

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 25.15

APTIM

Sample Collection Log

Location ID: 16EW01				Sample No: 16EW01-200309						
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
3/9/20	0850	100	.5	25.22	6.75	16.92	6.81	18.6	-69	5.05
	0855	100	1.0	25.27	7.34	17.31	6.47	17.6	-77	4.85
	0900	100	1.5	25.31	7.39	17.34	6.38	17.0	-78	4.73
	0905	100	2.0	25.33	7.40	17.37	6.37	16.8	-78	4.71
	0910	100	2.5	25.35	7.41	17.40	6.36	16.0	-79	4.69
	0915	100	3.0	25.36	7.41	17.42	6.36	15.2	-79	4.68

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Location ID: **16EW02**

Project No: **501032**

Sampler(s): Scott Bressinger

FIELD CONDITIONS Cloudy/ Light Rain

SAMPLING INFORMATION

Sample No: 16EW02-200309 **DATE/TIME:** 3/9/20 0931 **Pump Inlet Depth:** 24.00

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	Alkalinity by SM2320B	1 x 250 mL HPDE	Cool 4C
		ALSHT	Anions-Nitrate,Sulfate,Bromide by 9056	1 x 250 mL HPDE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2
		MI	DHC IN WATER CENSUS	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow /Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 3/9/20 0945

Depth to Water - Initial (DTWi) (ft) 21.65

Purge End Date/Time: 3/9/20 1015

Depth to Well Bottom (ft) 29.70

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~21.50-26.50~~ 21.75-26.75 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/28/2020

Approximate depth of pump inlet*(ft): 24.00

Pump Start Time: 0945

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 21.65

APTIM

Sample Collection Log

Location ID: 16EW02 Sample No: 16EW02-2003_09

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
3/9/20	0950	100	.5	21.72	4.40	17.69	7.14	1.3	-12	4.21
	0955	100	1.0	21.77	4.13	17.89	6.95	0.0	38	3.97
	1000	100	1.5	21.81	4.16	17.93	6.87	0.0	53	3.81
	1005	100	2.0	21.84	4.16	17.98	6.87	0.0	54	3.80
	1010	100	2.5	21.86	4.17	18.03	6.86	0.0	54	3.78
	1015	100	3.0	21.88	4.17	18.08	6.86	0.0	55	3.77

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16EW04**

Sampler(s): Scott Beesinger

FIELD CONDITIONS

Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 16EW04-200309

DATE/TIME: 3/9/20 1031

Pump Inlet Depth: 16.50

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 6"

Purge Start Date/Time: 3/9/20 1045

Depth to Water - Initial (DTWi) (ft) 6.00

Purge End Date/Time: 3/9/20 1115

Depth to Well Bottom (ft) 19.70

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~14.00-19.00~~ 13.95-18.95 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 16.50

Pump Start Time: 1045

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER 6.00

APTIM

Sample Collection Log

Location ID: 16EW04 Sample No: 16EW04-2003D9

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
3/9/20	1050	100	.5	6.08	2.02	17.15	7.61	3.9	48	3.45
	1055	100	1.0	6.13	1.94	16.91	7.30	3.5	63	3.02
	1100	100	1.5	6.15	1.94	16.91	7.27	3.2	64	2.83
	1105	100	2.0	6.17	1.93	16.90	7.26	3.0	65	2.81
	1110	100	2.5	6.19	1.93	16.91	7.26	2.8	65	2.79
	1115	100	3.0	6.20	1.93	16.90	7.26	2.5	65	2.78

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16IW04**

Sampler(s): Scott Bressinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16IW04-2003 10 **DATE/TIME:** 3/10/20 0738 **Pump Inlet Depth:** 22.75

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 3/10/20 0850

Depth to Water - Initial (DTWi) (ft) 16.05

Purge End Date/Time: 3/10/20 0920

Depth to Well Bottom (ft) 28.35

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): 17.75 - 27.75

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.75

Pump Start Time: 0850

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 16.05

APTIM

Sample Collection Log

Location ID: 16IW04 Sample No: 16IW04-2003 10

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
3/10/20	0855	100	.5	16.12	5.64	17.97	6.90	57.7	-67	0.77
	0900	100	1.0	16.18	5.57	17.95	6.58	52.1	-75	0.29
	0905	100	1.5	16.22	5.57	17.96	6.57	50.7	-78	0.07
	0910	100	2.0	16.25	5.56	17.97	6.56	50.3	-78	0.07
	0915	100	2.5	16.27	5.56	17.98	6.56	48.8	-79	0.06
	0920	100	3.0	16.28	5.56	17.99	6.56	48.5	-79	0.06

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16IW20**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Cloudy

SAMPLING INFORMATION

Sample No: 16IW20-200309 **DATE/TIME:** 3/9/20 0735 **Pump Inlet Depth:** 19.41

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	Alkalinity by SM2320B	1 x 250 mL HPDE	Cool 4C
		ALSHT	Anions-Nitrate,Sulfate,Bromide by 9056	1 x 250 mL HPDE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2
		MI	DHC IN WATER CENSUS	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 3/9/20 0745

Depth to Water - Initial (DTWi) (ft) 16.07

Purge End Date/Time: 3/9/20 0815

Depth to Well Bottom (ft) 25.48

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): 14.91-24.91 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y (N)

L George 05/20/2020

Approximate depth of pump inlet*(ft): 19.41

Pump Start Time: 0745

Ferrous Iron (Required Y or (N)) _____ mg/L

2ND DEPTH TO WATER 16.07

APTIM

Sample Collection Log

Location ID: 16IW20				Sample No: 16IW20-200309						
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
3/9/20	0750	100	.5	16.14	4.87	17.36	7.98	26.8	-158	3.08
	0755	100	1.0	16.20	5.01	17.02	6.57	21.7	-189	2.83
	0800	100	1.5	16.24	5.13	16.99	6.50	21.2	-226	2.65
	0805	100	2.0	16.26	5.14	16.96	6.50	21.6	-228	2.63
	0810	100	2.5	16.27	5.15	16.93	6.49	21.3	-229	2.61
	0815	100	3.0	16.28	5.15	16.90	6.49	21.5	-230	2.60

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16PM06**

Sampler(s): Scott Bressinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16PM06-200310 **DATE/TIME:** 3/10/20 0930 **Pump Inlet Depth:** 22.65

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 2"

Purge Start Date/Time: 3/10/20 0940

Depth to Water - Initial (DTWi) (ft) 15.73

Purge End Date/Time: 3/10/20 1010

Depth to Well Bottom (ft) 27.50

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.80 - 27.50~~ 18.2-28.2 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.65

Pump Start Time: 0940

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 15.73

APTIM

Sample Collection Log

Location ID: 16PM06 Sample No: 16PM06-2003_10

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
3/10/20	0945	100	.5	15.80	5.23	18.10	6.48	77.6	-37	0.85
	0950	100	1.0	15.86	5.22	18.20	6.23	68.3	-52	0.32
	0955	100	1.5	15.90	5.21	18.28	6.22	66.0	-52	0.10
	1000	100	2.0	15.93	5.20	18.34	6.21	65.7	-53	0.10
	1005	100	2.5	15.95	5.20	18.38	6.21	65.1	-53	0.09
	1010	100	3.0	15.97	5.20	18.42	6.21	64.5	-53	0.09

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16PM09**

Sampler(s): Scott Bassinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16PM09-2003_16 **DATE/TIME:** 3/10/20 1020 **Pump Inlet Depth:** 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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/BLADDER PUMP

Casing ID (in.): 2"

Purge Start Date/Time: 3/10/20 1030

Depth to Water - Initial (DTWi) (ft) 13.92

Purge End Date/Time: 3/10/20 1100

Depth to Well Bottom (ft) 27.18

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~17.10 - 26.80~~ 16.8-26.8 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 21.95

Pump Start Time: 1030

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 13.92

APTIM

Sample Collection Log

Location ID: 16PM09 Sample No: 16PM09-2003 10										
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
3/10/20	1035	100	.5	13.99	1.42	19.24	6.85	1000	14	1.28
	1040	100	1.0	14.05	0.945	19.35	6.31	1000	58	0.81
	1045	100	1.5	14.08	0.875	19.37	6.35	1000	72	0.66
	1050	100	2.0	14.10	0.874	19.39	6.35	1000	73	0.65
	1055	100	2.5	14.12	0.873	19.41	6.36	1000	74	0.64
	1100	100	3.0	14.13	0.873	19.43	6.36	1000	75	0.64

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16PM14**

Sampler(s): Scott Buessinger

FIELD CONDITIONS Clear

SAMPLING INFORMATION

Sample No: 16PM14-20031D **DATE/TIME:** 3/10/20 0745 **Pump Inlet Depth:** 28.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 3/10/20 0800

Depth to Water - Initial (DTWi) (ft) 17.20

Purge End Date/Time: 3/10/20 0830

Depth to Well Bottom (ft) 28.20

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~18.20 - 27.80~~ 18-28 FT BTOC

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 28.00

Pump Start Time: 0800

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water – 17.20

APTIM

Sample Collection Log

Location ID: 16PM14 Sample No: 16PM14-2003 10

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
3/10/20	0800	100	.5	17.28	6.26	17.85	5.76	31.3	171	0.83
	0805	100	1.0	17.33	6.72	17.93	6.32	24.2	95	0.32
	0810	100	1.5	17.37	6.76	17.94	6.34	22.9	91	0.09
	0815	100	2.0	17.40	6.77	17.96	6.35	22.6	90	0.09
	0820	100	2.5	17.42	6.78	17.97	6.35	22.1	89	0.08
	0825	100	3.0	17.44	6.78	17.98	6.36	21.8	88	0.08

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW03**

Sampler(s): Scott Bressinger

FIELD CONDITIONS Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 16RW03-200309

DATE/TIME: 3/9/20 1125

Pump Inlet Depth: 17.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Casing ID (in.): 4"

Depth to Water - Initial (DTWi) (ft) 4.77

Depth to Well Bottom (ft) 23.08

Screen Interval (ft): ~~12.90 - 22.90~~ 13.34-23.34 FT BTOC

L George 05/28/2020

Approximate depth of pump inlet*(ft): 17.90

Ferrous Iron (Required Y or N) _____ mg/L

Purging Method/Equipment: Low flow / Bladder Pump

Purge Start Date/Time: 3/9/20 1135

Purge End Date/Time: 3/9/20 1205

Discharge Tube Length: NA

PID Reading: NA

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Pump Start Time: 1135

2ND Depth to water - 4.77

APTIM

Sample Collection Log

Location ID: 16RW03					Sample No: 16RW03-200309					
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
3/9/20	1140	100	.5	4.85	0.765	16.86	6.75	1.2	160	1.03
	1145	100	1.0	4.90	0.734	16.80	5.88	0.0	184	0.61
	1150	100	1.5	4.93	0.734	16.80	5.65	0.0	196	0.35
	1155	100	2.0	4.95	0.734	16.80	5.64	0.0	197	0.34
	1200	100	2.5	4.97	0.735	16.80	5.63	0.0	198	0.33
	1205	100	3.0	4.99	0.735	16.80	5.62	0.0	199	0.32

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW04**

Sampler(s): Scott Bassinger

FIELD CONDITIONS Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 16RW04-200309 **DATE/TIME:** 3/9/20 1213 **Pump Inlet Depth:** ~~[illegible]~~ 21.45

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow / Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/9/20 1225

Depth to Water - Initial (DTWi) (ft) 17.50

Purge End Date/Time: 3/9/20 1255

Depth to Well Bottom (ft) 27.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~16.45-26.45~~ 16.9-26.9 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): ~~[illegible]~~ 21.45

Pump Start Time: 1225

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 17.50

APTIM

Sample Collection Log

Location ID: 16RW04 Sample No: 16RW04-200309

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
3/9/20	1230	100	.5	17.57	1.88	17.55	5.56	17.1	212	0.98
	1235	100	1.0	17.62	2.04	17.60	5.21	13.6	240	0.45
	1240	100	1.5	17.65	2.06	17.60	5.10	13.5	248	0.22
	1245	100	2.0	17.67	2.06	17.60	5.09	13.3	249	0.21
	1250	100	2.5	17.69	2.06	17.61	5.08	13.2	250	0.21
	1255	100	3.0	17.70	2.06	17.61	5.07	13.1	250	0.20

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW08**

Sampler(s): Scott Bressinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16RW08-200311 **DATE/TIME:** 3/11/20 1020 **Pump Inlet Depth:** 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 1025

Depth to Water - Initial (DTWi) (ft) 22.22

Purge End Date/Time: 3/11/20 1055

Depth to Well Bottom (ft) 30.45

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00-30.00~~ 19.25-29.25 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 1025

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER- 22.22

APTIM

Sample Collection Log

Location ID: 16RW08 Sample No: 16RW08-2003 11

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
3/31/20	1030	100	.5	22.30	4.67	20.75	7.16	4.6	39	1.05
	1035	100	1.0	22.36	4.67	21.83	6.75	1.2	25	0.88
	1040	100	1.5	22.40	4.67	22.19	6.75	0.0	26	0.64
	1045	100	2.0	22.42	4.68	22.30	6.76	0.0	27	0.65
	1050	100	2.5	22.44	4.68	22.40	6.76	0.0	27	0.66
	1055	100	3.0	22.46	4.68	22.46	6.76	0.0	28	0.67

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW09**

Sampler(s): Scott Bessinger

FIELD CONDITIONS Clear

SAMPLING INFORMATION

Sample No: 16RW09-200311 **DATE/TIME:** 3/11/20 0915 **Pump Inlet Depth:** ~~[illegible]~~ 26.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 0930

Depth to Water - Initial (DTWi) (ft) 24.93

Purge End Date/Time: 3/11/20 1000

Depth to Well Bottom (ft) 30.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00-30.00~~ 19.67-29.67 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): ~~[illegible]~~ 26.00

Pump Start Time: 0930

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 24.93

APTIM

Sample Collection Log

Location ID: 16RW09 Sample No: 16RW09-200311

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
3/11/20	0935	100	.5	25.00	4.71	19.12	6.96	0.3	49	0.77
	0940	100	1.0	25.06	4.60	19.38	6.71	0.0	54	0.25
	0945	100	1.5	25.10	4.61	19.46	6.70	0.0	54	0.05
	0950	100	2.0	25.13	4.62	19.53	6.70	0.0	54	0.05
	0955	100	2.5	25.15	4.62	19.59	6.69	0.0	53	0.04
	1000	100	3.0	25.17	4.62	19.63	6.69	0.0	53	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW09**

Sampler(s): Scott Beesinger

FIELD CONDITIONS Clear

SAMPLING INFORMATION

Sample No: 16RW09-2003 11 -MS **DATE/TIME:** 3/11/20 0915 **Pump Inlet Depth:** 26.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 0930

Depth to Water - Initial (DTWi) (ft) 24.93

Purge End Date/Time: 3/11/20 1000

Depth to Well Bottom (ft) 30.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00-30.00~~ 19.67-29.67 FT BTOC

L George 05/20/2020

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

Approximate depth of pump inlet*(ft): 26.00

Pump Start Time: 0930

Ferrous Iron (Required Y or N) _____ mg/L

2ND Depth to water - 24.93

APTIM

Sample Collection Log

Location ID: 16RW09				Sample No: 16RW09-2003 11 -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
3/11/20	0935	100	.5	25.00	4.71	19.12	6.96	0.3	49	0.77
	0940	100	1.0	25.06	4.60	19.38	6.71	0.0	54	0.25
	0945	100	1.5	25.10	4.61	19.46	6.70	0.0	54	0.05
	0950	100	2.0	25.13	4.62	19.53	6.70	0.0	54	0.05
	0955	100	2.5	25.15	4.62	19.59	6.69	0.0	53	0.04
	1000	100	3.0	25.17	4.62	19.63	6.69	0.0	53	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW09**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16RW09-20031 1 -MSD **DATE/TIME:** 3/11/20 0915 **Pump Inlet Depth:** 26.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 0930

Depth to Water - Initial (DTWi) (ft) 24.93

Purge End Date/Time: 3/11/20 1000

Depth to Well Bottom (ft) 30.65

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00-30.00~~ 19.67-29.67 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 26.00

Pump Start Time: 0930

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 24.93

APTIM

Sample Collection Log

Location ID: 16RW09 Sample No: 16RW09-2003 11 -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
3/11/20	0935	100	.5	25.00	4.71	19.12	6.96	0.3	49	0.77
	0940	100	1.0	25.06	4.60	19.38	6.71	0.0	54	0.25
	0945	100	1.5	25.10	4.61	19.46	6.70	0.0	54	0.05
	0950	100	2.0	25.13	4.62	19.53	6.70	0.0	54	0.05
	0955	100	2.5	25.15	4.62	19.59	6.69	0.0	53	0.04
	1000	100	3.0	25.17	4.62	19.63	6.69	0.0	53	0.04

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW10**

Sampler(s): Scott Bressinger

FIELD CONDITIONS Clear

SAMPLING INFORMATION

Sample No: 16RW10-2003 11 **DATE/TIME:** 3/11/20 0825 **Pump Inlet Depth:** 22.80

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 0835

Depth to Water - Initial (DTWi) (ft) 14.83

Purge End Date/Time: 3/11/20 0905

Depth to Well Bottom (ft) 28.22

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~17.80 - 27.80~~ 17.98-27.98 FT BTOC

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.80

Pump Start Time: 0835

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 14.83

APTIM

Sample Collection Log

Location ID: 16RW10 Sample No: 16RW10-2003 11

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
3/11/20	0840	100	.5	14.90	1.53	18.22	6.94	17.3	121	1.33
	0845	100	1.0	14.96	2.15	18.28	6.85	7.1	85	1.01
	0850	100	1.5	15.00	1.93	18.30	6.65	3.0	52	0.90
	0855	100	2.0	15.03	1.92	18.33	6.65	2.6	51	0.89
	0900	100	2.5	15.05	1.91	18.36	6.64	2.1	50	0.87
	0905	100	3.0	15.07	1.91	18.39	6.64	1.9	50	0.86

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16RW12**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16RW12-2003 10 **DATE/TIME:** 3/10/20 1215 **Pump Inlet Depth:** 25.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Low flow / BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/10/20 1225

Depth to Water - Initial (DTWi) (ft) 23.20

Purge End Date/Time: 3/10/20 1255

Depth to Well Bottom (ft) 32.20

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~20.00 - 30.00~~ 21.49-31.49 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 25.00

Pump Start Time: 1225

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 23.20

APTIM

Sample Collection Log

Location ID: 16RW12 Sample No: 16RW12-2003 10

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
3/10/20	1230	100	.5	23.27	4.11	19.83	5.87	8.3	25	1.88
	1235	100	1.0	23.33	4.33	19.83	6.29	4.2	14	1.54
	1240	100	1.5	23.37	4.40	19.98	6.63	1.8	8	1.37
	1245	100	2.0	23.40	4.40	20.06	6.64	1.2	8	1.36
	1250	100	2.5	23.42	4.40	20.11	6.64	0.7	7	1.35
	1255	100	3.0	23.44	4.40	20.16	6.65	0.2	7	1.34

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW12**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16WW12-2003 11 **DATE/TIME:** 3/11/20 0733 **Pump Inlet Depth:** 22.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/11/20 0745

Depth to Water - Initial (DTWi) (ft) 15.78

Purge End Date/Time: 3/11/20 0815

Depth to Well Bottom (ft) 27.00

Discharge Tube Length: NA PID Reading: NA

Screen Interval (ft): ~~17.00 - 27.00~~ 16.64-26.64 FT BTOC

Discharge Tube Diameter: 1/4" Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 22.00

Pump Start Time: 0745

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 15.78

APTIM

Sample Collection Log

Location ID: 16WW12 Sample No: 16WW12-2003 11

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% 5.25		±0.1 units	No criteria		± 10% or 0.2 mg/L
3/11/20	0750	100	.5	15.85	[redacted]	19.62	6.75	37.2	144	1.07
	0755	100	1.0	15.91	5.43	18.10	6.55	29.5	153	0.81
	0800	100	1.5	15.95	5.71	17.70	6.43	28.0	155	0.63
	0805	100	2.0	15.98	5.72	17.61	6.42	27.7	156	0.62
	0810	100	2.5	16.00	5.73	17.53	6.41	27.2	157	0.62
	0815	100	3.0	16.02	5.73	17.46	6.41	26.8	158	0.61

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW26**

Sampler(s): Scott Baessinger

FIELD CONDITIONS Cloudy / Light Rain

SAMPLING INFORMATION

Sample No: 16WW26-200309 **DATE/TIME:** 3/9/20 1304 **Pump Inlet Depth:** 19.00

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	Alkalinity by SM2320B	1 x 250 mL HPDE	Cool 4C
		ALSHT	Anions-Nitrate,Sulfate,Bromide by 9056	1 x 250 mL HPDE	Cool 4C
		ALSHT	Dissolved Gases in Water by RSK175	3 x 40 mL Glass	HCL<pH2
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	2 x 40 mL Amber	H2SO4
		ALSHT	VOCs in Water by 8260B	3 x 40 mL Glass	HCL<pH2
		MI	DHC IN WATER CENSUS	1 x 1 L HDPE	Cool 4C

WELL AND PURGING INFORMATION

Measuring Point : Top of Casing

Purging Method/Equipment: Lowflow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/9/20 1320

Depth to Water - Initial (DTWi) (ft) 14.84

Purge End Date/Time: 3/9/20 1350

Depth to Well Bottom (ft) 21.85

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~16.50 - 21.50~~ 15.97-20.97 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 19.00

Pump Start Time: 1320

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER- 14.84

APTIM

Sample Collection Log

Location ID: 16WW26 Sample No: 16WW26-2003 09

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
3/9/20	1325	100	.5	14.90	1.15	17.81	5.40	127	226	0.83
	1330	100	1.0	14.95	1.09	17.60	5.09	111	247	0.31
	1335	100	1.5	14.99	1.09	17.56	4.75	110	263	0.08
	1340	100	2.0	15.02	1.09	17.52	4.74	~~109~~ 109	264	0.08
	1345	100	2.5	15.04	1.09	17.47	4.73	108	265	0.07
	1350	100	3.0	15.05	1.09	17.45	4.72	108	266	0.07

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW40**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16WW40-200310 **DATE/TIME:** 3/10/20 1302 **Pump Inlet Depth:** 12.00

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 2"

Purge Start Date/Time: 3/10/20 1315

Depth to Water - Initial (DTWi) (ft) 9.80

Purge End Date/Time: 3/10/20 1345

Depth to Well Bottom (ft) 17.50

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~7.00 – 17.00~~ 10.8-20.8 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 12.00

Pump Start Time: 1315

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 9.80

APTIM

Sample Collection Log

Location ID: 16WW40 Sample No: 16WW40-2003 10

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
3/10/20	1320	100	.5	9.88	6.71	20.12	6.44	162	70	0.81
	1325	100	1.0	9.93	6.77	20.07	6.31	147	79	0.35
	1330	100	1.5	9.96	6.76	20.06	6.31	144	79	0.07
	1335	100	2.0	9.98	6.75	20.04	6.30	143	79	0.07
	1340	100	2.5	10.00	6.75	20.02	6.30	142	78	0.07
	1345	100	3.0	10.02	6.75	20.00	6.30	141	78	0.06

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW42**

Sampler(s): Scott Beessinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16WW42-200310 **DATE/TIME:** 3/10/20 1110 **Pump Inlet Depth:** 9.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/BLADDER Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/10/20 1125

Depth to Water - Initial (DTWi) (ft) 4.02

Purge End Date/Time: 3/10/20 1200

Depth to Well Bottom (ft) 15.45

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~4.90 - 14.90~~ 6.57-16.57 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 9.90

Pump Start Time: 1125

Ferrous Iron (Required Y or N) _____ mg/L

2ND DEPTH TO WATER - 4.02

APTIM

Sample Collection Log

Location ID: 16WW42 Sample No: 16WW42-2003 10

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
3/10/20	1130	100	.5	4.10	0.209	18.24	6.17	10.3	142	2.41
	1135	100	1.0	4.16	0.178	18.10	5.12	3.0	212	2.12
	1140	100	1.5	4.20	0.162	17.89	5.09	1.8	240	1.83
	1145	100	2.0	4.23	0.159	17.69	5.13	1.5	240	1.57
	1150	100	2.5	4.24	0.158	17.65	5.14	1.9	240	1.55
	1155	100	3.0	4.25	0.158	17.59	5.15	2.0	241	1.53
	1200	100	3.5	4.25	0.158	17.54	5.15	2.2	241	1.52

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

APTIM

Sample Collection Log

Project Name: **Longhorn AAP**

Project No: **501032**

Location ID: **16WW42**

Sampler(s): Scott Beesinger

FIELD CONDITIONS CLEAR

SAMPLING INFORMATION

Sample No: 16WW42-2003 10 -FD **DATE/TIME:** 3/10/20 1110 **Pump Inlet Depth:** 9.90

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	Bromide by SW9056 (Water)	1 x 250 mL HDPE	Cool 4C
		ALSHT	Perchlorate in Water by 6850	1 x 125 mL HDPE	Cool 4C
		ALSHT	TOC in Water by SM5310	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 Casing

Purging Method/Equipment: Low flow/Bladder Pump

Casing ID (in.): 4"

Purge Start Date/Time: 3/10/20 1125

Depth to Water - Initial (DTWi) (ft) 4.02

Purge End Date/Time: 3/10/20 1200

Depth to Well Bottom (ft) 15.45

Discharge Tube Length: NA

PID Reading: NA

Screen Interval (ft): ~~4.90 - 14.90~~ 6.57-16.57 FT BTOC

Discharge Tube Diameter: 1/4"

Immersible Layer: Y / N

L George 05/20/2020

Approximate depth of pump inlet*(ft): 9.90

Pump Start Time: 1125

Ferrous Iron (Required Y or N) _____ mg/L

2nd Depth to water - 4.02

APTIM

Sample Collection Log

Location ID: 16WW42				Sample No: 16WW42-2003 10-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
3/10/20	1130	100	.5	4.10	0.209	18.24	6.17	10.3	142	2.41
	1135	100	1.0	4.16	0.178	18.10	5.12	3.0	212	2.12
	1140	100	1.5	4.20	0.162	17.89	5.09	1.8	240	1.83
	1145	100	2.0	4.23	0.159	17.69	5.13	1.5	240	1.57
	1150	100	2.5	4.24	0.158	17.65	5.14	1.9	240	1.55
	1155	100	3.0	4.25	0.158	17.59	5.15	2.0	241	1.53
	1200	100	3.5	4.25	0.158	17.54	5.15	2.2	241	1.52

Logged by: _____ Date: _____

QC'd by: _____ Date: _____

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • April 2021

Appendix D

Analytical Results

(Provided electronically in separate PDF on CD and Portal)

Appendix E

Quality Control Summary Report

APPENDIX E

QUALITY CONTROL SUMMARY REPORT

ACRONYMS AND ABBREVIATIONS

%	percent
%D	percent difference
ALS	ALS Environmental Laboratories
CCB	continuing calibration blank
DHC	Dehalococcoides
DoD	U.S. Department of Defense
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
ICP	interference check sample
ISB	*in-situ* bioremediation
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LHAAP	Longhorn Army Ammunition Plant
LOQ	limit of quantitation
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
QAPP	Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas: Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan
QC	quality control
QCSR	quality control summary report
QSM	Quality Systems Manual
RPD	relative percent difference
RRF	relative response factor
SDG	sample delivery group
SM	standard method
SOP	standard operating procedure
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1. QUALITY CONTROL SUMMARY REPORT

This Quality Control Summary Report (QCSR) describes the findings of the review of data for groundwater sampling activities conducted from October 9, 2018 through March 11, 2020, and is provided to document the quality of the analytical data used in the *Remedial Action Completion Report, LHAAP-16 Landfill, Longhorn Army Ammunition Plant, Karnack Texas*. Sampling procedures and overall quality control (QC) and quality assurance protocols for groundwater sampling are presented in the *Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant, Karnack Texas (IWWP): Appendix A: Standard Operating Procedures and Appendix B: Basewide Uniform Federal Policy-Quality Assurance Project Plan (QAPP), U.S Army Corps of Engineer [USACE], May 8, 2018)*.

This QCSR focuses on the data quality and usability of the samples collected from the following sampling events:

- October 2018 Baseline Groundwater Sampling Event
- February and August 2019 Baseline Groundwater Sampling Events (new wells 16WW51, 16WW56, 16WW57, and 16WW58)
- September 2019 Baseline Groundwater Sampling Event
- October 2019 *in-situ* bioremediation (ISB) Performance Monitoring – Bayou Biobarrier
- November 2019 ISB Performance Monitoring – Mid Plume (Shallow Zone)
- November 2019 ISB Performance Monitoring – Landfill Biobarrier #1
- November 2019 ISB Performance Monitoring – Landfill Biobarrier #3
- December 2019 ISB Performance Monitoring – Mid Plume (Intermediate Zone)
- January 2020 ISB Performance Monitoring – Landfill Biobarrier #2
- October, November, and December 2019 bromide and total organic carbon (TOC) Sampling
- March 2020 Design Effectiveness

During the period from October 9, 2018, through March 11, 2020, groundwater samples were collected and submitted to the primary laboratory, ALS Environmental Laboratories (ALS) located in Houston, Texas. ALS in Houston performed all analyses in house with the exception of the following:

- TOC analysis was performed by ALS in Kelso, Washington, as well as Houston, Texas.
- Dissolved gases analysis was completed by ALS in Simi Valley, California, as wells as Houston, Texas.

- Perchlorate analysis was conducted by ALS in Salt Lake, Utah.
- Groundwater samples for Dehalococcoides (DHC) analysis were submitted to Microbial Insights Laboratory in Knoxville, Tennessee.

ALS Laboratories in all four locations are accredited by the U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) Version 5.1 and National Environmental Laboratory Accreditation Program (NELAP) in the State of Texas to perform the analyses throughout the project duration.

Groundwater and surface water samples from the 2018 and 2019 baseline sampling events were analyzed for one or more of the following lists of parameters:

- Volatile Organic Compounds (VOCs) – EPA Method 8260C
- Perchlorate – EPA Method 6850
- TOC – Standard Method (SM) 5310C
- Dissolved gases – RSK 175
- Anions – EPA Method 9056A
- Alkalinity – SM 2320B
- Metals – EPA Method 6020A
- DHC – Laboratory Standard Operating Procedure (SOP)

Groundwater samples from the remaining sampling events were analyzed for the following:

- TOC – SM 5310C
- Bromide – EPA Method 9056A

Specific analyses performed for each sample and for each sampling event are presented in **Appendix E Table 1**. All analytical results from October 2018 through March 2020 sampling activities were received in sample delivery groups (SDGs). **Appendix D** presents laboratory data packages. **Appendix E Table 1** (provided at the end of this report) summarizes SDG numbers, sample numbers, sample locations, sample collection dates, analysis methods, analysis dates, and laboratories. APTIM project chemists manually performed EPA Level III data review on 100% of the groundwater and surface water sample results. EPA Level III data review was performed in accordance with the guidelines and control criteria specified in the following documents:

- QAPP (USACE 2018)
- *DoD Quality Systems Manual for Environmental Laboratories, Version 5.1* (2017)

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (2006), SW-846* (EPA, 1996 and updates)
- *Standard Methods for the Examination of Water and Wastewater (21st Edition)* (American Public Health Association et al., 2005)
- *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Superfund Methods Data Review* (EPA, 2017)
- *USEPA Contract Laboratory Program*, *National Functional Guidelines for Inorganic Superfund Methods Data Review*, *Final* (EPA, 2017)

The following QC elements were included in the EPA Level III data review:

- Sample preservation and sample extraction and analysis holding times
- Laboratory method blanks
- Initial and continuing calibration blanks (metals, anions, TOC analyses only)
- Surrogate recoveries (organic analyses)
- Laboratory control sample (LCS)/laboratory control sample duplicate (LCSD) recoveries
- Matrix spike (MS)/matrix spike duplicate (MSD) recoveries
- Relative percent differences (RPDs)
- Initial calibration and initial calibration verifications (ICVs)
- Continuing calibration verifications (CCVs)
- Inductively coupled plasma (ICP) interference check samples (ICS) (metal analysis only)
- ICP serial dilutions (metal analysis only)
- Field blanks

Analytical data were reviewed in terms of precision, bias, representativeness, comparability, and completeness as follows:

- *Bias* is demonstrated by recovery of target analytes from fortified blank and sample matrices, LCS/LCSD, and MS/MSD, respectively. For organic methods, bias is also demonstrated through recovery of surrogates from each field and QC sample. The recovery of target analytes from fortified samples is compared with the acceptance criteria defined in the QAPP (USACE, 2018) and DoD Quality Systems Manual (QSM). When the acceptance criteria are not available in the QAPP or DoD QSM, results are compared with the laboratory in-house control limits. When these criteria are not met, the data are qualified accordingly.

- *Precision* is expressed as the RPD between the results of replicate sample analyses: sample duplicates, LCSDs, and MSDs. When analyte RPDs exceed the acceptance criteria, the data are qualified accordingly.
- *Representativeness* of the samples submitted for analysis is ensured by adherence to standard sampling techniques and protocols.
- *Comparability* of sample results is ensured through the use of approved sampling and analysis methods.
- *Completeness* is expressed as a ratio of the number of usable data points to the total number of analytical data results.

The following sections present the EPA Level III data review findings. The discussion summarizes data quality exceedances and their potential impact on the quality and usability of analytical results. **Appendix E Table 2** presents definitions of data qualification. **Appendix E Table 3** summarizes the qualified data.

1.1 Data Quality Outliers

1.1.1 Sample Preservation and Sample Extraction and Analysis Holding Times (Reason Codes 02, 02A, and 02B)

The sample coolers and samples contained within were received intact at the laboratory and were held within the required 0 to 6 degrees Celsius, and when required, were chemically preserved in accordance with EPA and SM preservation requirements.

Sample holding times were evaluated by comparing the sample collection dates to the sample extraction and analysis dates. Extraction and analysis holding times were reviewed for all samples to determine the validity of the sample results. Analysis holding time requirements were achieved for all samples and for all analyses.

1.1.2 Laboratory Method Blanks (Reason Code 06A)

The field sample results were evaluated with respect to the laboratory method blank prepared and analyzed for each analytical batch and for each analytical method. Positive analyte detections in a laboratory method blank were observed. Specific contaminants, analytical method, the detected levels, and the limits of quantitation (LOQs) are summarized as follows:

SDG Number	Analytical Method	Laboratory QC Batch No.	Contaminant	Contaminant Level (mg/L)	LOQ (mg/L)
HS19111080/K1911032	SM5310C	K1911032MB2	TOC	0.14	0.5

Notes:

LOQ limit of quantitation
mg/L milligrams per liter
No. number
SDG sample delivery group
TOC total organic carbon

Based on the DoD QSM requirements (2017), laboratory method blank concentrations are considered acceptable when contaminant levels in the blank are less than one-half the LOQ for target analytes and less than the LOQ for common laboratory contaminants, such as acetone and methylene chloride. As indicated in the preceding table, the laboratory method blank level was below one-half the LOQ, and thus met the blank acceptance criteria.

The low level laboratory method blank detection did not affect the sample results as the concentrations of TOC in all samples associated with the blank far exceeded five times the blank level. No data qualification was applied to the results of any TOC samples. Except where noted, all laboratory method blanks were free of contaminants for VOCs, perchlorate, anions, dissolved gases, metals, alkalinity, and DHC analyses.

1.1.3 Initial and Continuing Calibration Blanks (Reason Code 06B)

In addition to the laboratory method blanks for anions, TOC and metals analyses, initial and continuing calibration blank (CCB) results were reviewed to ensure that the instrument was free of contamination prior to the analysis. All initial and continuing calibration blanks were free of contaminants with the exception of the following:

SDG Number	Analytical Method	Laboratory QC Batch No.	Contaminant	Contaminant Level (mg/L)	LOQ (mg/L)
HS19111065/K1911033	SM5310C	CCB3	TOC	0.23	0.5
HS19111080/K1911032	SM5310C	CCB3	TOC	0.23	0.5
HS19111080/K1911032	SM5310C	CCB5	TOC	0.23	0.5

Notes:

LOQ limit of quantitation
mg/L milligrams per liter
No. number

SDG *sample delivery group*
TOC *total organic carbon*

As presented above, the continuing calibration blank levels for TOC were reported slightly below one-half the LOQ and met the DoD QSM blank acceptance criteria. The concentrations of TOC in all samples associated with the calibration blanks were greater than five times the blank levels, and therefore were not affected by the blank detections. No data qualification was applied to any results due to the low level calibration blank detections. Except for TOC, all other calibration blanks were free of anions and metals.

1.1.4 Surrogate Recoveries (Reason Codes 07, 07A, and 07B)

Surrogate standards are organic compounds added to field and laboratory QC samples for organic analysis to evaluate the matrix effect and method performance on an individual sample basis. Prior to analysis, surrogates 1,2-dichloroethane-d4, 4-bromofluorobenzene, dibromofluoromethane, and toluene-d8 were spiked into all samples analyzed for VOCs. The surrogates in all samples were recovered within the accuracy specifications.

1.1.5 Laboratory Control Sample/Laboratory Control Sample Duplicate Recoveries and Precisions (Reason Codes 11, 11A, and 11B)

The LCS is an aliquot of analyte-free matrix spiked with target analytes that is prepared with each analytical batch for each analytical method. The recovery of target analytes from the LCS analysis is a measurement of method performance in an interference-free sample matrix. The review indicated that LCS recoveries and precisions met the established QC requirements for VOCs, perchlorate, metals, anions, TOC, dissolved gases, alkalinity, and DHC analyses.

In addition to the LCS analysis, the laboratory performed sample duplicate analysis on project-specific groundwater samples to assess precisions of sample results. The laboratory duplicate analysis was performed for LHAAP-16 samples submitted for alkalinity, anions, dissolved gases, and TOC analyses. Non-compliant laboratory duplicate precisions were noted for TOC analysis, as summarized below:

SDG Number	Analytical Method	Duplicate Sample ID	Laboratory RPD Outlier (%)	RPD Control Limit (%)	Data Qualification
HS19111065/K1911033	SM5310C	16RW02-191119	31	10	J
HS19111065/K1911033	SM5310C	16RW03-191119	11	10	J

As a result of the laboratory duplicate precision outliers, results of TOC in the affected samples were qualified as estimated (J). There is no impact on the data usability due to the minor precision outliers. Acceptable precision results were reported for alkalinity, anions, and dissolved gases analyses.

1.1.6 Matrix Spike/Matrix Spike Duplicate Recoveries and Precisions (Reason Codes 08, 08A, and 08B)

The MS and MSD samples are a portion of a field sample spiked with target analytes that are prepared with each analytical batch and with each method. The MS/MSD results are used to evaluate any bias introduced to the method due to matrix interference, and to measure bias and precision for each analytical batch.

In accordance with the QAPP requirements (USACE, 2018), the MS/MSD samples are to be collected at a rate of 1 per 20 samples or 5%. During each groundwater sampling event, 5% MS/MSD samples were collected achieving the MS/MSD sample frequency requirement. In addition, the laboratory performed MS/MSD analysis on LHAAP-16 samples to achieve laboratory internal QC requirements. The following site-specific groundwater samples were spiked for MS/MSD analysis:

SDG Number	Sample Number	Sample Date	MS/MSD Analysis
HS18100492	16WW24-181009	10/9/2018	VOCs, anions, perchlorate, TOC, and dissolved gases
HS18100548	16WW31-181010	10/10/2018	VOCs and perchlorate
HS18100548	16WW16-181010	10/10/2018	TOC
HS18100725	16WW32-181011	10/11/2018	Perchlorate
HS18100726	16SW01-181011	10/11/2018	VOCs and metals
HS18100726	16SW02-181011	10/11/2018	Perchlorate
HS18100726	16SW03-181011	10/11/2018	Perchlorate
HS18100727	16WW40-181012	10/12/2018	VOCs, Bromide
HS18100823	16WW29-181015	10/15/2018	TOC
HS19020335	16WW56-190206	2/6/2019	TOC
HS19080827	16WW57-190815	8/15/2019	VOC
HS19090860	16WW14-190916	9/16/2019	VOC
HS19090962	16WW57-190918	9/18/2019	VOC, dissolved gases, TOC, and anions
HS19090962	16WW29-190918	9/18/2019	VOC, perchlorate
HS19090964	16WW49-190918	9/18/2019	VOC
HS19090964	16WW58-190919	9/19/2019	Perchlorate and TOC

HS19101353	16WW22-191022	10/22/2019	Bromide and TOC
HS19101488	16WW40-191022	10/22/2019	Bromide and TOC
HS19110026	16EW06-Event2-191031	10/31/2019	Bromide
HS19110484	16WW06-191108	11/8/2019	Bromide and TOC
HS19111065	16WW42-191109	11/9/2019	Bromide and TOC
HS19111080	16RW-191120	11/20/2019	Bromide
HS19120309	16WW11-191205	12/5/2019	Bromide and TOC
HS19120336	16WW12B-191206	12/6/2019	Bromide
HS19120208	16WW11-191208	12/8/2019	TOC
HS19120673	16EW11-191212	12/12/2029	Bromide and TOC
HS19121313	16EW07-191213	12/13/2019	Bromide and TOC
HS19121088	16EW11-191218	12/18/2019	Bromide and TOC
HS20011144	16WW36-200123	1/23/2020	Bromide and TOC
HS20030390	16RW04-200309	3/9/2020	Bromide
HS20030472	16PM06-200310	3/10/2020	TOC
HS20030502	16RW09-200311	3/11/2020	Bromide and TOC

The majority of the MS results met the established bias and precision requirements; however, MS recovery biases were observed for dissolved gases and TOC analyses, which are summarized as follows:

SDG Number	Analytical Method	Spiked Sample	MS Recovery Outlier (%)	MS Recovery Control Limit (%)	Data Qualification
HS18100492	RSK 175	16WW24-181009	Ethene: 158/151	72-133	J
HS20011144 / K2000749	SM5310C	16WW36-200123	TOC: -78	83-117	J

As presented above, the reported MS and MSD recoveries for ethene exceeded the upper control limit; however, the precision between the MS and MSD recoveries met the acceptance criteria. The high biased MS and MSD recoveries led to qualification of the detected results for ethene as estimated (J). Due to suspected matrix interference, no recoveries were reported for TOC in the spiked sample 16WW36. TOC in the spiked sample was detected and the detected result was consequently qualified as estimated (J). This data qualification was applied to the results of the listed analytes in the spiked samples only. It should be noted that the LCS results associated with the non-compliant batches met the bias and precision

control criteria, which demonstrated that acceptable batch bias and precision were achieved for dissolved gases and TOC analyses.

In addition to above, the parent concentrations of VOCs and anions in a few spiked samples exceeded four times their respective spiked levels. The elevated sample concentrations produced matrix interference, which affected the accuracy of the MS analysis. Because the parent concentrations were greater than four times the spiked levels, no data qualification was applied to the results of VOCs and anions.

Except as noted, the MS precision and bias results were acceptable for all other analyses.

1.1.7 Initial Calibration (Reason Codes 04, 04A, and 04B)

Instrument calibration is performed for VOCs, dissolved gases, perchlorate, metals, anions, and TOC analyses according to the EPA method requirements (EPA, 1996). The linear analytical range is established for each method by analysis of calibration standards prepared at increasing concentrations that cover the expected sample concentrations. The acceptability of the initial calibration is determined by calculation of a percent relative standard deviation or coefficient. The initial calibration results were acceptable for all the listed analyses.

Immediately after the initial calibration for each analysis, initial calibration verification was conducted at the mid-point of instrument calibration range by using a second-source calibration standard to verify the accuracy of the initial calibration. The review indicated acceptable initial calibration verification results for all analyses.

1.1.8 Continuing Calibration Verification (Reason Codes 05, 05A, and 05B)

Routinely during sample analysis, the stability of the analytical system is monitored by analysis of continuing calibration standards at concentrations near the mid-point of the instrument calibration range. The percent difference (%D) values between the relative response factor (RRF) in the initial calibration and the RRF in the continuing calibration met the calibration requirements for all analyses.

1.1.9 Interference Check Samples (Reason Code 12)

The ICS verifies the inter-element and background correction factors. An ICS was analyzed at the required frequencies, and all ICS results were within the established control limit for metals analysis for the October 2018 baseline sampling event.

1.1.10 ICP Serial Dilutions (Reason Code 13)

The ICP serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. When the concentration of an analyte exceeds 50 times the method detection limit (MDL), an ICP serial dilution is performed at a five-fold dilution and the results between the original analysis and the diluted analysis are compared. The results of the ICP serial dilution are deemed acceptable when a percent difference between the original analysis and the diluted analysis is less than or equal to 10%. The ICP serial dilution results met the accuracy goal for all samples and for all metals.

1.1.11 Trip Blanks (Reason Code 06D)

Trip blanks were prepared by the laboratory and stored with the groundwater and surface water samples collected for VOCs analysis. One trip blank was submitted per cooler containing VOCs samples. No VOCs were detected in any of trip blanks. Therefore, the trip blank results were acceptable and demonstrated that valid sample storage and shipping procedures were implemented.

1.1.12 Field Duplicates

In accordance with the QAPP requirements (USACE, 2018), field duplicate samples are to be collected at a minimum rate of 10% of the total number of groundwater samples. Field duplicate samples are evaluated by calculating the RPD between the parent sample and its duplicate. The RPD is calculated using the following equation:

$$RPD = |(S-D)/[(S+D)/2]| \times 100$$

Where:

S = sample result

D = duplicate result

Acceptable precision control criteria are established at less than or equal to 30% for water samples. The RPD is calculated between pairs of field duplicate samples when both results are reported at or above the LOQ.

A total of 15 field duplicates were collected from the period of October 9, 2018, through March 11, 2020. Field duplicates were collected using the same sampling technique and analyzed for the same analytical parameters as their associated parent samples, **Appendix E Table 4** presents the field duplicate results. With the exception of the RPD result for methane for a field duplicate pair (16WW24-181009) from the October 2018 baseline sampling event, the field RPDs for all detected pairs ranged from 0 to 18.77% achieving the 30% precision goal for all analyses. The field RPD for methane was calculated at 65.85%

for the field duplicate pair (16WW24-181009) and was outside the field precision requirement. The field RPD outlier does not affect the data usability of the methane results as other QC elements, such as laboratory method blanks, holding time, LCS accuracy and precision and calibrations for the affected duplicate pair, were within the acceptance criteria. Overall, the field duplicate results demonstrated acceptable field sampling and analytical precision for all methods.

1.2 Completeness

The following sections present a discussion of technical completeness for the LHAAP-16 groundwater and surface water sampling events. Completeness results are calculated for groundwater, surface water and field duplicate samples that are used for project decisions. Completeness results are not calculated for trip blanks. Completeness results are presented in **Appendix E Table 5**.

1.2.1 Technical Completeness

Technical completeness is a quantitative measure of the data usability based on the number of rejected data compared to the total number of sample results. The technical completeness goal for each method is equal to or greater than 95%. The technical completeness calculation considers all data that are not rejected to be usable. The technical completeness is calculated as follows:

$$\% \text{ Technical Completeness} = \frac{\text{Number of Usable Results}}{\text{Total Number of Results}} \times 100$$

As discussed in the previous sections, results of TOC and dissolved gases were qualified as estimated (J) due to non-compliant sample duplicate precisions or MS and MSD recoveries; however, these data quality exceedances did not affect the data usability. The technical completeness was 100% for all methods for the LHAAP-16 groundwater and surface sampling activities, exceeding the 95% technical completeness objective. Therefore, the project data quality objectives were achieved for all methods for the LHAAP-16 groundwater and surface water sampling events.

1.3 Representativeness and Comparability

During sampling, samplers followed the approved QAPP requirements (USACE, 2018) and established sampling SOPs to collect, preserve, document, and ship samples to off-site laboratories, thus ensuring the representativeness of the groundwater and surface water samples collected for the sampling events.

Upon sample receipt, the laboratory reviewed sample conditions to ensure that sample containers, preservatives (when applicable), and requested analyses matched the chain-of-custody requirements.

Discrepancies between the chain-of-custody forms and sample containers were brought to the attention of the APTIM project chemist and resolved prior to sample analysis.

ALS Laboratories are DoD and NELAP certified and adhered to the most current EPA Methods, QAPP (USACE, 2018), and DoD QSM (2017) requirements to prepare, analyze, and report the data. This ensures the comparability of the analytical results between different samples and different sampling events. APTIM project chemists performed EPA Level III data validation on 100% of the analytical data obtained from the October 2018 through March 2020 sampling events to verify that the laboratories complied with the DoD QSM, QAPP, and method requirements. Analytical results that were outside the established QC requirements were qualified and the data quality and usability were discussed in the previous sections. Based on a review of the chain-of-custody forms, sample receipt forms, and laboratory data packages, the analytical data reported for LHAAP-16 sampling events has met the comparability requirements.

1.4 Summary

The analytical data has been reviewed for precision, bias, representativeness, comparability, and completeness. Data quality exceedances consisted of non-compliant laboratory duplicate precisions, low-level laboratory method blank and calibration blank contamination, and MS and MSD recoveries. The affected results were qualified as estimated (J). In all cases, the degree of these data quality exceedances was considered minor and the data usability was not affected. The 95% technical completeness goal was exceeded for all methods for all the sampling events. All data are usable for their intended purposes.

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TABLES

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Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS18100492	16 BASELINE OCT 2018	16TB01-181009	FIELDQC	10/09/2018	TB	SW8260	10/16/2018	ALSHT
043PJ	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	SW8260	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW43-181009	16WW43	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	SW8260	10/18/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW26-181009	16WW26	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	SW8260	10/18/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW41-181009	16WW41	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	SW8260	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW25-181009	16WW25	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	SW8260	10/18/2018	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS18100492	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16EW02-181009	16EW02	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	SW6850	10/17/2018	ALSS
1828552	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	SW8260	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	SW9056	10/11/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	SW8260	10/18/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW24-181009	16WW24	10/09/2018	REG	SM5310	10/18/2018	ALS
K1809960	16 BASELINE OCT 2018	16WW24-181009-FD	16WW24	10/09/2018	FD	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	SW8260	10/19/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16WW36-181009	16WW36	10/09/2018	REG	SM5310	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	CENSUS	10/23/2018	MI
1828552	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	SW6850	10/17/2018	ALSS
HS18100492	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	RSK-175	10/16/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	SM2320B	10/12/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	SW8260	10/18/2018	ALSHT
HS18100492	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	SW9056	10/11/2018	ALSHT
K1809960	16 BASELINE OCT 2018	16EW06-181009	16EW06	10/09/2018	REG	SM5310	10/18/2018	ALS
HS18100548	16 BASELINE OCT 2018	16TB02-181010	FIELDQC	10/10/2018	TB	SW8260	10/18/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW38-181010	16WW38	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW38-181010	16WW38	10/10/2018	REG	SW8260	10/19/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW44-181010	16WW44	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW44-181010	16WW44	10/10/2018	REG	SW8260	10/18/2018	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
1828822	16 BASELINE OCT 2018	16WW33-181010	16WW33	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW33-181010	16WW33	10/10/2018	REG	SW8260	10/18/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW37-181010	16WW37	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW37-181010	16WW37	10/10/2018	REG	SW8260	10/18/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW45-181010	16WW45	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW45-181010	16WW45	10/10/2018	REG	SW8260	10/18/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW14-181010	16WW14	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW14-181010	16WW14	10/10/2018	REG	SW8260	10/18/2018	ALSHT
1828822	16 BASELINE OCT 2018	16WW34-181010	16WW34	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW34-181010	16WW34	10/10/2018	REG	SW8260	10/18/2018	ALSHT
043PJ	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	CENSUS	10/23/2018	MI
1828822	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	RSK-175	10/18/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	SM2320B	10/16/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	SW8260	10/19/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	SW9056	10/11/2018	ALSHT
K1810021	16 BASELINE OCT 2018	16WW35-181010	16WW35	10/10/2018	REG	SM5310C	10/18/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	CENSUS	10/23/2018	MI
1828822	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	RSK-175	10/18/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	SM2320B	10/16/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	SW8260	10/19/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	SW9056	10/11/2018	ALSHT
K1810021	16 BASELINE OCT 2018	16WW16-181010	16WW16	10/10/2018	REG	SM5310C	10/18/2018	ALS
1828822	16 BASELINE OCT 2018	16WW31-181010	16WW31	10/10/2018	REG	SW6850	10/19/2018	ALSS
1828822	16 BASELINE OCT 2018	16WW31-181010-FD	16WW31	10/10/2018	FD	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW31-181010	16WW31	10/10/2018	REG	SW8260	10/18/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW31-181010-FD	16WW31	10/10/2018	FD	SW8260	10/19/2018	ALSHT
043PJ	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	CENSUS	10/23/2018	MI
1828822	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	RSK-175	10/18/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	SM2320B	10/16/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	SW8260	10/19/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	SW9056	10/11/2018	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
K1810021	16 BASELINE OCT 2018	16WW22-181010	16WW22	10/10/2018	REG	SM5310C	10/18/2018	ALS
1828822	16 BASELINE OCT 2018	16WW39-181010	16WW39	10/10/2018	REG	SW6850	10/19/2018	ALSS
HS18100548	16 BASELINE OCT 2018	16WW39-181010	16WW39	10/10/2018	REG	SW8260	10/19/2018	ALSHT
HS18100548	16 BASELINE OCT 2018	16WW39-181010	16WW39	10/10/2018	REG	SW9056	10/11/2018	ALSHT
HS18100725	16 BASELINE OCT 2018	16TB03-181011	FIELDQC	10/11/2018	TB	SW8260	10/19/2018	ALSHT
1828987	16 BASELINE OCT 2018	16WW32-181011	16WW32	10/11/2018	REG	SW6850	10/24/2018	ALSS
HS18100725	16 BASELINE OCT 2018	16WW32-181011	16WW32	10/11/2018	REG	SW8260	10/19/2018	ALSHT
HS18100725	16 BASELINE OCT 2018	16EW05-181011	16EW05	10/11/2018	REG	SW9056	10/17/2018	ALSHT
HS18100726	16 BASELINE SW OCT 2018	16TB04-181011	FIELDQC	10/11/2018	TB	SW8260	10/19/2018	ALSHT
1828988	16 BASELINE SW OCT 2018	16SW01-181011-FD	16SW01	10/11/2018	FD	SW6850	10/24/2018	ALSS
HS18100726	16 BASELINE SW OCT 2018	16SW01-181011-FD	16SW01	10/11/2018	FD	SW6020	10/24/2018	ALSHT
HS18100726	16 BASELINE SW OCT 2018	16SW01-181011-FD	16SW01	10/11/2018	FD	SW8260	10/19/2018	ALSHT
1828988	16 BASELINE SW OCT 2018	16SW01-181011	16SW01	10/11/2018	REG	SW6850	10/24/2018	ALSS
HS18100726	16 BASELINE SW OCT 2018	16SW01-181011	16SW01	10/11/2018	REG	SW6020	10/24/2018	ALSHT
HS18100726	16 BASELINE SW OCT 2018	16SW01-181011	16SW01	10/11/2018	REG	SW8260	10/19/2018	ALSHT
1828988	16 BASELINE SW OCT 2018	16SW02-181011	16SW02	10/11/2018	REG	SW6850	10/24/2018	ALSS
HS18100726	16 BASELINE SW OCT 2018	16SW02-181011	16SW02	10/11/2018	REG	SW6020	10/24/2018	ALSHT
HS18100726	16 BASELINE SW OCT 2018	16SW02-181011	16SW02	10/11/2018	REG	SW8260	10/19/2018	ALSHT
1828988	16 BASELINE SW OCT 2018	16SW03-181011	16SW03	10/11/2018	REG	SW6850	10/24/2018	ALSS
HS18100726	16 BASELINE SW OCT 2018	16SW03-181011	16SW03	10/11/2018	REG	SW6020	10/24/2018	ALSHT
HS18100726	16 BASELINE SW OCT 2018	16SW03-181011	16SW03	10/11/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16TB05-181012	FIELDQC	10/12/2018	TB	SW8260	10/19/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW30-181012	16WW30	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW30-181012	16WW30	10/12/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW30-181012	16WW30	10/12/2018	REG	SW9056	10/17/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW46-181012	16WW46	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW46-181012	16WW46	10/12/2018	REG	SW8260	10/19/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW23-181012	16WW23	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW23-181012	16WW23	10/12/2018	REG	SW8260	10/19/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW40-181012	16WW40	10/12/2018	REG	SW6850	10/24/2018	ALSS
1828989	16 BASELINE OCT 2018	16WW40-181012-FD	16WW40	10/12/2018	FD	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW40-181012	16WW40	10/12/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW40-181012	16WW40	10/12/2018	REG	SW9056	10/17/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW40-181012-FD	16WW40	10/12/2018	FD	SW8260	10/19/2018	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS18100727	16 BASELINE OCT 2018	16WW40-181012-FD	16WW40	10/12/2018	FD	SW9056	10/17/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW27-181012	16WW27	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW27-181012	16WW27	10/12/2018	REG	SW8260	10/20/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW12-181012	16WW12	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW12-181012	16WW12	10/12/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW12-181012	16WW12	10/12/2018	REG	SW9056	10/17/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW42-181012	16WW42	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW42-181012	16WW42	10/12/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW42-181012	16WW42	10/12/2018	REG	SW9056	10/17/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW13-181012	16WW13	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW13-181012	16WW13	10/12/2018	REG	SW8260	10/19/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW13-181012	16WW13	10/12/2018	REG	SW9056	10/17/2018	ALSHT
1828989	16 BASELINE OCT 2018	16WW21-181012	16WW21	10/12/2018	REG	SW6850	10/24/2018	ALSS
HS18100727	16 BASELINE OCT 2018	16WW21-181012	16WW21	10/12/2018	REG	SW8260	10/20/2018	ALSHT
HS18100727	16 BASELINE OCT 2018	16WW21-181012	16WW21	10/12/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW08-181013	16EW08	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW07-181013	16EW07	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW15-181013	16EW15	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW11-181013	16EW11	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW14B-181013	16EW14B	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW12B-181013	16EW12B	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16EW13-181013	16EW13	10/13/2018	REG	SW9056	10/17/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16TB06-181015	FIELDQC	10/15/2018	TB	SW8260	10/23/2018	ALSHT
043PJ	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	CENSUS	10/23/2018	MI
1829115	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	SW6850	10/24/2018	ALSS
HS18100823	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	RSK-175	10/18/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	SM2320B	10/18/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	SW8260	10/23/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	SW9056	10/17/2018	ALSHT
K1810155	16 BASELINE OCT 2018	16WW29-181015	16WW29	10/15/2018	REG	SM5310C	10/30/2018	ALS
043PJ	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	CENSUS	10/23/2018	MI
1829115	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	SW6850	10/24/2018	ALSS
HS18100823	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	RSK-175	10/18/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	SM2320B	10/18/2018	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS18100823	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	SW8260	10/23/2018	ALSHT
HS18100823	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	SW9056	10/17/2018	ALSHT
K1810155	16 BASELINE OCT 2018	16WW55-181015	16WW55	10/15/2018	REG	SM5310C	10/30/2018	ALS
HS18101079	16 BASELINE OCT 2018	16TB07-101018	FIELDQC	10/18/2018	TB	SW8260	10/23/2018	ALSHT
043PJ	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	CENSUS	10/23/2018	MI
1829552	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	SW6850	10/25/2018	ALSS
HS18101079	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	RSK-175	10/25/2018	ALSHT
HS18101079	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	SM2320B	10/20/2018	ALSHT
HS18101079	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	SW8260	10/24/2018	ALSHT
HS18101079	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	SW9056	10/19/2018	ALSHT
K1810282	16 BASELINE OCT 2018	16WW48-181018	16WW48	10/18/2018	REG	SM5310C	10/30/2018	ALS
1904012	16 BASELINE (NEW) FEB 2019	16WW51-190206	16WW51	02/06/2019	REG	SW6850	02/19/2019	ALSS
HS19020335	16 BASELINE (NEW) FEB 2019	16WW51-190206	16WW51	02/06/2019	REG	SW8260	02/12/2019	ALSHT
HS19020335	16 BASELINE (NEW) FEB 2019	16WW51-190206	16WW51	02/06/2019	REG	SW9056	02/21/2019	ALSHT
017QB	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	CENSUS	02/14/2019	MI
1904012	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	SW6850	02/19/2019	ALSS
HS19020335	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	RSK-175	02/15/2019	ALSHT
HS19020335	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	SM2320B	02/16/2019	ALSHT
HS19020335	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	SW8260	02/12/2019	ALSHT
HS19020335	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	SW9056	02/07/2019	ALSHT
K1901286	16 BASELINE (NEW) FEB 2019	16WW56-190206	16WW56	02/06/2019	REG	SM5310C	02/19/2019	ALS
HS19080827	16 BASELINE (NEW) AUG 2019	FIELDQC-190815-TB1	FIELDQC	08/15/2019	TB	SW8260	08/20/2019	ALSHT
1923490	16 BASELINE (NEW) AUG 2019	16WW57-190815	16WW57	08/15/2019	REG	SW6850	08/20/2019	ALSS
HS19080827	16 BASELINE (NEW) AUG 2019	16WW57-190815	16WW57	08/15/2019	REG	SW8260	08/20/2019	ALSHT
1923490	16 BASELINE (NEW) AUG 2019	16WW58-190815	16WW58	08/15/2019	REG	SW6850	08/20/2019	ALSS
1923490	16 BASELINE (NEW) AUG 2019	16WW58-190815-FD	16WW58	08/15/2019	FD	SW6850	08/20/2019	ALSS
HS19080827	16 BASELINE (NEW) AUG 2019	16WW58-190815	16WW58	08/15/2019	REG	SW8260	08/20/2019	ALSHT
HS19080827	16 BASELINE (NEW) AUG 2019	16WW58-190815-FD	16WW58	08/15/2019	FD	SW8260	08/20/2019	ALSHT
HS19090860	16 BASELINE SEP 2019	16LHAAP-TB1-190916	FIELDQC	09/16/2019	TB	SW8260	09/25/2019	ALSHT
HS19090860	16 BASELINE SEP 2019	16LHAAP-TB2-190916	FIELDQC	09/16/2019	TB	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW14-190916	16WW14	09/16/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW14-190916	16WW14	09/16/2019	REG	SW8260	09/24/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW16-190916	16WW16	09/16/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW16-190916	16WW16	09/16/2019	REG	SW8260	09/24/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
1927207	16 BASELINE SEP 2019	16WW36-190916	16WW36	09/16/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW36-190916	16WW36	09/16/2019	REG	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW42-190916	16WW42	09/16/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW42-190916	16WW42	09/16/2019	REG	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW22-190917	16WW22	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW22-190917	16WW22	09/17/2019	REG	SW8260	09/24/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW27-190917	16WW27	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW27-190917	16WW27	09/17/2019	REG	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW41-190917	16WW41	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW41-190917	16WW41	09/17/2019	REG	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW39-190917	16WW39	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW39-190917	16WW39	09/17/2019	REG	SW8260	09/27/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW43-190917	16WW43	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW43-190917	16WW43	09/17/2019	REG	SW8260	09/24/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW56-190917	16WW56	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW56-190917	16WW56	09/17/2019	REG	SW8260	09/24/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW23-190917	16WW23	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW23-190917	16WW23	09/17/2019	REG	SW8260	09/24/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW40-190917	16WW40	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW40-190917	16WW40	09/17/2019	REG	SW8260	09/27/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW55-190917	16WW55	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW55-190917	16WW55	09/17/2019	REG	SW8260	09/25/2019	ALSHT
1927207	16 BASELINE SEP 2019	16WW24-190917	16WW24	09/17/2019	REG	SW6850	09/25/2019	ALSS
HS19090860	16 BASELINE SEP 2019	16WW24-190917	16WW24	09/17/2019	REG	SW8260	09/25/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW26-190917	16WW26	09/17/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW26-190917	16WW26	09/17/2019	REG	SW8260	09/27/2019	ALSHT
HS19090962	16 BASELINE SEP 2019	16LHAAP-TB-5-190918	FIELDQC	09/18/2019	TB	SW8260	09/26/2019	ALSHT
HS19090962	16 BASELINE SEP 2019	16LHAAP-TB3-190918	FIELDQC	09/18/2019	TB	SW8260	09/25/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW13-190918	16WW13	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW13-190918	16WW13	09/18/2019	REG	SW8260	09/27/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW12-190918	16WW12	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW12-190918	16WW12	09/18/2019	REG	SW8260	09/27/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW35-190918	16WW35	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW35-190918	16WW35	09/18/2019	REG	SW8260	09/26/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
1927216	16 BASELINE SEP 2019	16WW30-190918	16WW30	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW30-190918	16WW30	09/18/2019	REG	SW8260	09/27/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW29-190918	16WW29	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW29-190918	16WW29	09/18/2019	REG	SW8260	09/27/2019	ALSHT
1927216	16 BASELINE SEP 2019	16EW06-190918	16EW06	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16EW06-190918	16EW06	09/18/2019	REG	SW8260	09/26/2019	ALSHT
076QI	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	CENSUS	09/27/2019	MI
1927220	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	SW6850	10/01/2019	ALSS
1927220	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	SW6850	10/01/2019	ALSS
HS19090964	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	RSK-175	09/25/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	SM2320B	09/21/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	SW8260	09/29/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	SW9056	09/26/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	RSK-175	09/25/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	SM2320B	09/21/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	SW8260	09/29/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	SW9056	09/26/2019	ALSHT
K1908781	16 BASELINE SEP 2019	16WW58-190918	16WW58	09/18/2019	REG	SM5310C	09/26/2019	ALS
K1908781	16 BASELINE SEP 2019	16WW58-190918-FD	16WW58	09/18/2019	FD	SM5310C	09/26/2019	ALS
1927216	16 BASELINE SEP 2019	16EW02-190918	16EW02	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16EW02-190918	16EW02	09/18/2019	REG	SW8260	09/26/2019	ALSHT
076QI	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	CENSUS	09/27/2019	MI
1927216	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	RSK-175	09/25/2019	ALSHT
HS19090962	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	SM2320B	09/21/2019	ALSHT
HS19090962	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	SW8260	09/26/2019	ALSHT
HS19090962	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	SW9056	09/20/2019	ALSHT
K1908780	16 BASELINE SEP 2019	16WW57-190918	16WW57	09/18/2019	REG	SM5310C	09/26/2019	ALS
1927216	16 BASELINE SEP 2019	16WW26-190917-FD	16WW26	09/18/2019	FD	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW26-190917-FD	16WW26	09/18/2019	FD	SW8260	09/27/2019	ALSHT
1927216	16 BASELINE SEP 2019	16WW48-190918	16WW48	09/18/2019	REG	SW6850	09/30/2019	ALSS
HS19090962	16 BASELINE SEP 2019	16WW48-190918	16WW48	09/18/2019	REG	SW8260	09/27/2019	ALSHT
1927220	16 BASELINE SEP 2019	16WW51-190918	16WW51	09/18/2019	REG	SW6850	10/01/2019	ALSS
HS19090964	16 BASELINE SEP 2019	16WW51-190918	16WW51	09/18/2019	REG	SW8260	09/27/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS19090964	16 BASELINE SEP 2019	16LHAAP-TB6-190919	FIELDQC	09/19/2019	TB	SW8260	09/27/2019	ALSHT
1927220	16 BASELINE SEP 2019	16WW49-190919	16WW49	09/19/2019	REG	SW6850	10/01/2019	ALSS
HS19090964	16 BASELINE SEP 2019	16WW49-190919	16WW49	09/19/2019	REG	SW8260	09/29/2019	ALSHT
1927220	16 BASELINE SEP 2019	16WW25-190919	16WW25	09/19/2019	REG	SW6850	10/01/2019	ALSS
1927220	16 BASELINE SEP 2019	16WW25-190919-FD	16WW25	09/19/2019	FD	SW6850	10/01/2019	ALSS
HS19090964	16 BASELINE SEP 2019	16WW25-190919	16WW25	09/19/2019	REG	SW8260	09/27/2019	ALSHT
HS19090964	16 BASELINE SEP 2019	16WW25-190919-FD	16WW25	09/19/2019	FD	SW8260	09/27/2019	ALSHT
HS19101170	16 BROMIDE OCT 2019	16EW07-191018	16EW07	10/18/2019	REG	SW9056	10/21/2019	ALSHT
HS19101170	16 BROMIDE OCT 2019	16EW05-191018	16EW05	10/18/2019	REG	SW9056	10/21/2019	ALSHT
HS19101353	16 LF BB PM OCT 2019	16WW22-191022	16WW22	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16WW22-191022	16WW22	10/22/2019	REG	SM5310C	10/31/2019	ALS
HS19101353	16 LF BB PM OCT 2019	16RW12-191022	16RW12	10/22/2019	REG	SW9056	11/04/2019	ALSHT
HS19101353	16 LF BB PM OCT 2019	16RW12-191022-FD	16RW12	10/22/2019	FD	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16RW12-191022	16RW12	10/22/2019	REG	SM5310C	10/31/2019	ALS
K1909995	16 LF BB PM OCT 2019	16RW12-191022-FD	16RW12	10/22/2019	FD	SM5310C	10/31/2019	ALS
HS19101353	16 LF BB PM OCT 2019	16WW39-191022	16WW39	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16WW39-191022	16WW39	10/22/2019	REG	SM5310C	10/31/2019	ALS
HS19101353	16 LF BB PM OCT 2019	16RW11-191022	16RW11	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16RW11-191022	16RW11	10/22/2019	REG	SM5310C	11/07/2019	ALS
HS19101353	16 LF BB PM OCT 2019	16IW20-191022	16IW20	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16IW20-191022	16IW20	10/22/2019	REG	SM5310C	11/07/2019	ALS
HS19101353	16 LF BB PM OCT 2019	16WW12-191022	16WW12	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1909995	16 LF BB PM OCT 2019	16WW12-191022	16WW12	10/22/2019	REG	SM5310C	11/06/2019	ALS
HS19101343	16 BROMIDE OCT 2019	16EW06-191022	16EW06	10/22/2019	REG	SW9056	10/24/2019	ALSHT
HS19101343	16 BROMIDE OCT 2019	16EW08-191022	16EW08	10/22/2019	REG	SW9056	10/24/2019	ALSHT
HS19101488	16 LF BB PM OCT 2019	16WW40-191022	16WW40	10/22/2019	REG	SW9056	11/04/2019	ALSHT
K1910079	16 LF BB PM OCT 2019	16WW40-191022	16WW40	10/22/2019	REG	SM5310C	10/30/2019	ALS
HS19101603	16 BROMIDE OCT 2019	16EW07-191025	16EW07	10/25/2019	REG	SW9056	10/28/2019	ALSHT
HS19101603	16 BROMIDE OCT 2019	16EW05-191025	16EW05	10/25/2019	REG	SW9056	10/29/2019	ALSHT
HS19110026	16 BROMIDE OCT 2019	16EW06-EVENT2-191031	16EW06	10/31/2019	REG	SM5310B	11/02/2019	ALSHT
HS19110026	16 BROMIDE OCT 2019	16EW06-EVENT2-191031	16EW06	10/31/2019	REG	SW9056	11/04/2019	ALSHT
HS19110026	16 BROMIDE OCT 2019	16EW05-EVENT2-191031	16EW05	10/31/2019	REG	SM5310B	11/02/2019	ALSHT
HS19110026	16 BROMIDE OCT 2019	16EW07-EVENT2-191031	16EW07	10/31/2019	REG	SM5310B	11/02/2019	ALSHT
HS19110217	16 BROMIDE NOV 2019	16EW07-191105	16EW07	11/05/2019	REG	SM5310B	11/06/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS19110217	16 BROMIDE NOV 2019	16EW07-191105	16EW07	11/05/2019	REG	SW9056	11/06/2019	ALSHT
HS19110217	16 BROMIDE NOV 2019	16EW05-191105	16EW05	11/05/2019	REG	SM5310B	11/06/2019	ALSHT
HS19110217	16 BROMIDE NOV 2019	16EW05-191105	16EW05	11/05/2019	REG	SW9056	11/06/2019	ALSHT
HS19110304	16 BROMIDE NOV 2019	16EW08-191106	16EW08	11/06/2019	REG	SM5310B	11/08/2019	ALSHT
HS19110304	16 BROMIDE NOV 2019	16EW08-191106	16EW08	11/06/2019	REG	SW9056	11/07/2019	ALSHT
HS19110484	16 BROMIDE NOV 2019	16EW06-191108	16EW06	11/08/2019	REG	SM5310B	11/12/2019	ALSHT
HS19110484	16 BROMIDE NOV 2019	16EW06-191108	16EW06	11/08/2019	REG	SW9056	11/12/2019	ALSHT
HS19110619	16 BROMIDE NOV 2019	16EW05-191111	16EW05	11/11/2019	REG	SM5310B	11/13/2019	ALSHT
HS19110619	16 BROMIDE NOV 2019	16EW05-191111	16EW05	11/11/2019	REG	SW9056	11/13/2019	ALSHT
HS19110634	16 MIDPLUME(S) PM NOV 2019	16EW01-191111	16EW01	11/11/2019	REG	SW9056	11/25/2019	ALSHT
K1910765	16 MIDPLUME(S) PM NOV 2019	16EW01-191111	16EW01	11/11/2019	REG	SM5310C	11/17/2019	ALS
HS19110634	16 MIDPLUME(S) PM NOV 2019	16EW04-191111	16EW04	11/11/2019	REG	SW9056	11/25/2019	ALSHT
HS19110634	16 MIDPLUME(S) PM NOV 2019	16EW04-191111-FD	16EW04	11/11/2019	FD	SW9056	11/26/2019	ALSHT
K1910765	16 MIDPLUME(S) PM NOV 2019	16EW04-191111	16EW04	11/11/2019	REG	SM5310C	11/17/2019	ALS
K1910765	16 MIDPLUME(S) PM NOV 2019	16EW04-191111-FD	16EW04	11/11/2019	FD	SM5310C	11/21/2019	ALS
HS19110634	16 MIDPLUME(S) PM NOV 2019	16EW03-191111	16EW03	11/11/2019	REG	SW9056	11/25/2019	ALSHT
K1910765	16 MIDPLUME(S) PM NOV 2019	16EW03-191111	16EW03	11/11/2019	REG	SM5310C	11/17/2019	ALS
HS19110634	16 MIDPLUME(S) PM NOV 2019	16EW02-191111	16EW02	11/11/2019	REG	SW9056	11/25/2019	ALSHT
K1910765	16 MIDPLUME(S) PM NOV 2019	16EW02-191111	16EW02	11/11/2019	REG	SM5310C	11/17/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16RW01-191119	16RW01	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16RW01-191119	16RW01	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16RW04-191119	16RW04	11/19/2019	REG	SW9056	12/04/2019	ALSHT
HS19111065	16 LF BIO#1 PM NOV 2019	16RW04-191119-FD	16RW04	11/19/2019	FD	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16RW04-191119	16RW04	11/19/2019	REG	SM5310C	11/24/2019	ALS
K1911033	16 LF BIO#1 PM NOV 2019	16RW04-191119-FD	16RW04	11/19/2019	FD	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16WW26-191119	16WW26	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16WW26-191119	16WW26	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16RW05-191119	16RW05	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16RW05-191119	16RW05	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16RW02-191119	16RW02	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16RW02-191119	16RW02	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16RW03-191119	16RW03	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16RW03-191119	16RW03	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16IW09-191119	16IW09	11/19/2019	REG	SW9056	12/04/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
K1911033	16 LF BIO#1 PM NOV 2019	16IW09-191119	16IW09	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111065	16 LF BIO#1 PM NOV 2019	16WW42-191119	16WW42	11/19/2019	REG	SW9056	12/04/2019	ALSHT
K1911033	16 LF BIO#1 PM NOV 2019	16WW42-191119	16WW42	11/19/2019	REG	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16RW06-191120	16RW06	11/20/2019	REG	SW9056	11/26/2019	ALSHT
HS19111080	16 LF BIO#3 PM NOV 2019	16RW06-191120-FD	16RW06	11/20/2019	FD	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16RW06-191120	16RW06	11/20/2019	REG	SM5310C	11/24/2019	ALS
K1911032	16 LF BIO#3 PM NOV 2019	16RW06-191120-FD	16RW06	11/20/2019	FD	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16RW07-191120	16RW07	11/20/2019	REG	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16RW07-191120	16RW07	11/20/2019	REG	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16RW08-191120	16RW08	11/20/2019	REG	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16RW08-191120	16RW08	11/20/2019	REG	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16IW10-191120	16IW10	11/20/2019	REG	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16IW10-191120	16IW10	11/20/2019	REG	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16RW09-191120	16RW09	11/20/2019	REG	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16RW09-191120	16RW09	11/20/2019	REG	SM5310C	11/24/2019	ALS
HS19111080	16 LF BIO#3 PM NOV 2019	16RW10-191120	16RW10	11/20/2019	REG	SW9056	11/26/2019	ALSHT
K1911032	16 LF BIO#3 PM NOV 2019	16RW10-191120	16RW10	11/20/2019	REG	SM5310C	11/24/2019	ALS
HS19120208	16 BROMIDE DEC 2019	16EW11-191203	16EW11	12/03/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120208	16 BROMIDE DEC 2019	16EW12B-191203	16EW12B	12/03/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120208	16 BROMIDE DEC 2019	16EW13-191203	16EW13	12/03/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120208	16 BROMIDE DEC 2019	16EW14B-191203	16EW14B	12/03/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120208	16 BROMIDE DEC 2019	16EW15-191203	16EW15	12/03/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW11-191204	16EW11	12/04/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW11-191204	16EW11	12/04/2019	REG	SW9056	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW12B-191204	16EW12B	12/04/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW12B-191204	16EW12B	12/04/2019	REG	SW9056	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW13-191204	16EW13	12/04/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW13-191204	16EW13	12/04/2019	REG	SW9056	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW14B-191204	16EW14B	12/04/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW14B-191204	16EW14B	12/04/2019	REG	SW9056	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW15-191204	16EW15	12/04/2019	REG	SM5310B	12/06/2019	ALSHT
HS19120210	16 BROMIDE DEC 2019	16EW15-191204	16EW15	12/04/2019	REG	SW9056	12/06/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW11-191205	16EW11	12/05/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW11-191205	16EW11	12/05/2019	REG	SW9056	12/07/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS19120309	16 BROMIDE DEC 2019	16EW12B-191205	16EW12B	12/05/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW12B-191205	16EW12B	12/05/2019	REG	SW9056	12/07/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW13-191205	16EW13	12/05/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW13-191205	16EW13	12/05/2019	REG	SW9056	12/07/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW14B-191205	16EW14B	12/05/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW14B-191205	16EW14B	12/05/2019	REG	SW9056	12/07/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW15-191205	16EW15	12/05/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120309	16 BROMIDE DEC 2019	16EW15-191205	16EW15	12/05/2019	REG	SW9056	12/07/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW11-191206	16EW11	12/06/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW11-191206	16EW11	12/06/2019	REG	SW9056	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW12B-191206	16EW12B	12/06/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW12B-191206	16EW12B	12/06/2019	REG	SW9056	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW13-191206	16EW13	12/06/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW13-191206	16EW13	12/06/2019	REG	SW9056	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW14B-191206	16EW14B	12/06/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW14B-191206	16EW14B	12/06/2019	REG	SW9056	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW15-191206	16EW15	12/06/2019	REG	SM5310B	12/09/2019	ALSHT
HS19120336	16 BROMIDE DEC 2019	16EW15-191206	16EW15	12/06/2019	REG	SW9056	12/09/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW11-191209	16EW11	12/09/2019	REG	SM5310B	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW11-191209	16EW11	12/09/2019	REG	SW9056	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW12B-191209	16EW12B	12/09/2019	REG	SM5310B	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW12B-191209	16EW12B	12/09/2019	REG	SW9056	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW13-191209	16EW13	12/09/2019	REG	SM5310B	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW13-191209	16EW13	12/09/2019	REG	SW9056	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW14B-191209	16EW14B	12/09/2019	REG	SM5310B	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW14B-191209	16EW14B	12/09/2019	REG	SW9056	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW15-191209	16EW15	12/09/2019	REG	SM5310B	12/10/2019	ALSHT
HS19120453	16 BROMIDE DEC 2019	16EW15-191209	16EW15	12/09/2019	REG	SW9056	12/10/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW11-191212	16EW11	12/12/2019	REG	SM5310B	12/16/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW11-191212	16EW11	12/12/2019	REG	SW9056	12/14/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW12B-191212	16EW12B	12/12/2019	REG	SM5310B	12/16/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW12B-191212	16EW12B	12/12/2019	REG	SW9056	12/14/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW13-191212	16EW13	12/12/2019	REG	SM5310B	12/16/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW13-191212	16EW13	12/12/2019	REG	SW9056	12/14/2019	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS19120673	16 BROMIDE DEC 2019	16EW14B-191212	16EW14B	12/12/2019	REG	SM5310B	12/16/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW14B-191212	16EW14B	12/12/2019	REG	SW9056	12/14/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW15-191212	16EW15	12/12/2019	REG	SM5310B	12/16/2019	ALSHT
HS19120673	16 BROMIDE DEC 2019	16EW15-191212	16EW15	12/12/2019	REG	SW9056	12/14/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW11-191218	16EW11	12/18/2019	REG	SM5310B	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW11-191218	16EW11	12/18/2019	REG	SW9056	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW12B-191218	16EW12B	12/18/2019	REG	SM5310B	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW12B-191218	16EW12B	12/18/2019	REG	SW9056	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW13-191218	16EW13	12/18/2019	REG	SM5310B	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW13-191218	16EW13	12/18/2019	REG	SW9056	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW14B-191218	16EW14B	12/18/2019	REG	SM5310B	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW14B-191218	16EW14B	12/18/2019	REG	SW9056	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW15-191218	16EW15	12/18/2019	REG	SM5310B	12/23/2019	ALSHT
HS19121088	16 BROMIDE DEC 2019	16EW15-191218	16EW15	12/18/2019	REG	SW9056	12/23/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW05-E2-191223	16EW05	12/23/2019	REG	SM5310B	12/28/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW05-E2-191223	16EW05	12/23/2019	REG	SW9056	12/26/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW06-E2-191223	16EW06	12/23/2019	REG	SM5310B	12/30/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW06-E2-191223	16EW06	12/23/2019	REG	SW9056	12/26/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW06-E2-191223-FD	16EW06	12/23/2019	FD	SM5310B	12/30/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW06-E2-191223-FD	16EW06	12/23/2019	FD	SW9056	12/26/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW07-E2-191223	16EW07	12/23/2019	REG	SM5310B	12/28/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW07-E2-191223	16EW07	12/23/2019	REG	SW9056	12/26/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW08-E2-191223	16EW08	12/23/2019	REG	SM5310B	12/28/2019	ALSHT
HS19121313	16 MIDPLUME(I) PM DEC 2019	16EW08-E2-191223	16EW08	12/23/2019	REG	SW9056	12/26/2019	ALSHT
HS20011144	16 LF BIO#2 PM JAN 2020	16WW36-200123	16WW36	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16WW36-200123	16WW36	01/23/2020	REG	SM5310C	01/31/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16PM09-200123	16PM09	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16PM09-200123	16PM09	01/23/2020	REG	SM5310C	01/31/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16PM06-200123	16PM06	01/23/2020	REG	SW9056	02/06/2020	ALSHT
HS20011144	16 LF BIO#2 PM JAN 2020	16PM06-200123-FD	16PM06	01/23/2020	FD	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16PM06-200123	16PM06	01/23/2020	REG	SM5310C	01/31/2020	ALS
K2000749	16 LF BIO#2 PM JAN 2020	16PM06-200123-FD	16PM06	01/23/2020	FD	SM5310C	01/31/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16IW04-200123	16IW04	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16IW04-200123	16IW04	01/23/2020	REG	SM5310C	01/31/2020	ALS

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS20011144	16 LF BIO#2 PM JAN 2020	16IW03-200123	16IW03	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16IW03-200123	16IW03	01/23/2020	REG	SM5310C	02/13/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16PM14-200123	16PM14	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16PM14-200123	16PM14	01/23/2020	REG	SM5310C	01/31/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16PM02-200123	16PM02	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16PM02-200123	16PM02	01/23/2020	REG	SM5310C	01/31/2020	ALS
HS20011144	16 LF BIO#2 PM JAN 2020	16PM03-200123	16PM03	01/23/2020	REG	SW9056	02/06/2020	ALSHT
K2000749	16 LF BIO#2 PM JAN 2020	16PM03-200123	16PM03	01/23/2020	REG	SM5310C	01/31/2020	ALS
HS20030390	16 DES EFF MAR 2020	16IW20-200309	16IW20	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16IW20-200309	16IW20	03/09/2020	REG	SW9056	03/11/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW01-200309	16EW01	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW01-200309	16EW01	03/09/2020	REG	SW9056	03/17/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW02-200309	16EW02	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW02-200309	16EW02	03/09/2020	REG	SW9056	03/17/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW04-200309	16EW04	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16EW04-200309	16EW04	03/09/2020	REG	SW9056	03/10/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16RW03-200309	16RW03	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16RW03-200309	16RW03	03/09/2020	REG	SW9056	03/10/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16RW04-200309	16RW04	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16RW04-200309	16RW04	03/09/2020	REG	SW9056	03/10/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16WW26-200309	16WW26	03/09/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030390	16 DES EFF MAR 2020	16WW26-200309	16WW26	03/09/2020	REG	SW9056	03/10/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM14-200310	16PM14	03/10/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM14-200310	16PM14	03/10/2020	REG	SW9056	03/18/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16IW04-200310	16IW04	03/10/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16IW04-200310	16IW04	03/10/2020	REG	SW9056	03/18/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM06-200310	16PM06	03/10/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM06-200310	16PM06	03/10/2020	REG	SW9056	03/18/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM09-200310	16PM09	03/10/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16PM09-200310	16PM09	03/10/2020	REG	SW9056	03/18/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW42-200310	16WW42	03/10/2020	REG	SM5310B	03/12/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW42-200310	16WW42	03/10/2020	REG	SW9056	03/18/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW42-200310-FD	16WW42	03/10/2020	FD	SM5310B	03/13/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW42-200310-FD	16WW42	03/10/2020	FD	SW9056	03/18/2020	ALSHT

Appendix E Table 1: Summary of Samples Collected, Sample Date, Sample Location, and Analysis Method

SDG	Task Code	Sample ID	Location ID	Sample Date	Sample Purpose	Analytical Method	Analysis Date	Laboratory
HS20030472	16 DES EFF MAR 2020	16RW12-200310	16RW12	03/10/2020	REG	SM5310B	03/13/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16RW12-200310	16RW12	03/10/2020	REG	SW9056	03/19/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW40-200310	16WW40	03/10/2020	REG	SM5310B	03/13/2020	ALSHT
HS20030472	16 DES EFF MAR 2020	16WW40-200310	16WW40	03/10/2020	REG	SW9056	03/19/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW10-200311	16RW10	03/11/2020	REG	SM5310B	03/18/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW10-200311	16RW10	03/11/2020	REG	SW9056	03/19/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW09-200311	16RW09	03/11/2020	REG	SM5310B	03/18/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW09-200311	16RW09	03/11/2020	REG	SW9056	03/19/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW08-200311	16RW08	03/11/2020	REG	SM5310B	03/18/2020	ALSHT
HS20030502	16 DES EFF MAR 2020	16RW08-200311	16RW08	03/11/2020	REG	SW9056	03/19/2020	ALSHT

Notes:

ALS / ALSHT / ALSS - ALS Laboratories in Houston, Salt Lake City, Kelso, and Simi Valley.

FD - field duplicate

MI - Microbial Insights

REG - regular sample

SDG - sample delivery group

TB - trip blank

Appendix E Table 2: Data Qualification Flags

Data Qualifier Definitions for Organic and Inorganic Data Review

Qualifier	Definition
	No Qualifier indicates that the data are acceptable both qualitatively and quantitatively.
U	The analyte was analyzed for but was not detected above the reported limit of detection.
J	The analyte was analyzed for and was positively identified, but the reported numerical value may not be consistent with the amount actually present in the environmental sample. Results are estimated, although the data are considered usable and may be used as appropriate to meet project objectives. Results are qualitatively acceptable and quantitatively uncertain.
J-	The analyte was positively identified; the associated numerical value is its approximate concentration with a low bias in the sample.
J+	The analyte was positively identified; the associated numerical value is its approximate concentration with a high bias in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified," and the associated value represents its approximate concentration.
UJ	The analyte was not detected above the reported limit of detection. However, the reported limit of detection is approximate and may or may not represent the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.
X	The analyte was analyzed for, but the presence or absence of the analyte has not been verified. Re-sampling and re-analysis may be necessary to confirm or deny the presence of the analyte. Results are rejected, and data are unusable for any purposes.

Appendix E: Table 3 Qualified Data Summary

Sample	Sample Type	Sample Date	Analyte	SDG	Result	LOQ	Units	Qualifier
Reason Code 08A		**Method RSK-175**						
16WW24-181009	REG	10/09/2018	Ethylene	HS18100492	0.00139	0.00100	mg/L	J
Reason Code 08A		**Method SM5310C**						
16WW36-200123	REG	01/23/2020	Total organic carbon	K2000749	21	0.50	mg/L	J
Reason Code 11B		**Method SM5310C**						
16RW02-191119	REG	11/19/2019	Total organic carbon	K1911033	4.37	0.50	mg/L	J
16RW03-191119	REG	11/19/2019	Total organic carbon	K1911033	2.51	0.50	mg/L	J

Notes:

See Appendix E Table 2 for definitions of qualifiers.
J - estimated value
mg/L - milligrams per liter
LOQ - limit of quantitation
REG - regular sample
SDG - sample delivery group

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16EW04				Relative Percent Difference
			Sample Number	16EW04-191111		16EW04-191111-FD		
			Sample Date	11/11/2019		11/11/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	2.48		2.54		2.39
	Total organic carbon	mg/L	N	13.6		15.3		11.76

			Location Code	16EW06				Relative Percent Difference
			Sample Number	16EW06-E2-191223		16EW06-E2-191223-FD		
			Sample Date	12/23/2019		12/23/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	52.5 - 52.5 ft		52.5 - 52.5 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	521		539		3.40
	Total organic carbon	mg/L	N	144,000		137,000		4.98

			Location Code	16PM06				Relative Percent Difference
			Sample Number	16PM06-200123		16PM06-200123-FD		
			Sample Date	01/23/2020		01/23/2020		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	22.65 - 22.65 ft		22.65 - 22.65 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	2.74		2.74		0.00
	Total organic carbon	mg/L	N	9.03		9.01		0.22

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16RW04				Relative Percent Difference
			Sample Number	16RW04-191119		16RW04-191119-FD		
			Sample Date	11/19/2019		11/19/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	0.66		0.656		0.61
	Total organic carbon	mg/L	N	2.81		2.8		0.36

			Location Code	16RW06				Relative Percent Difference
			Sample Number	16RW06-191120		16RW06-191120-FD		
			Sample Date	11/20/2019		11/20/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	5.03		5.05		0.40
	Total organic carbon	mg/L	N	1.54		1.55		0.65

			Location Code	16RW12				Relative Percent Difference
			Sample Number	16RW12-191022		16RW12-191022-FD		
			Sample Date	10/22/2019		10/22/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	3.85		3.9		1.29
	Total organic carbon	mg/L	N	1.78		1.91		7.05

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16SW01				Relative Percent Difference
			Sample Number	16SW01-181011		16SW01-181011-FD		
			Sample Date	10/11/2018		10/11/2018		
			Sample Purpose	REG		FD		
			Sample Type	SW		SW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
METALS	Arsenic	mg/L	T	0.00204		0.00212		3.85
	Chromium	mg/L	T	0.000499	J	0.000515	J	NC
	Manganese	mg/L	T	0.545		0.586		7.25
	Nickel	mg/L	T	0.00756		0.00786		3.89
	Thallium	mg/L	T	0.000418	J	0.001	U	NC
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
VOLATILES	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	1,2-Dichloroethane	µg/L	N	0.5	U	0.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Vinyl chloride	µg/L	N	0.5	U	0.5	U	NC

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16WW24				Relative Percent Difference
			Sample Number	16WW24-181009		16WW24-181009-FD		
			Sample Date	10/09/2018		10/09/2018		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	10.17 - 11.1 ft		10.17 - 11.1 ft		
Test Group	**Parameter**	**Units**	**Filtered**	**Result**	**VQ**	**Result**	**VQ**	
DHC	Dehalococcoides	cells/mL	N	1.6		-NA-		0.00
	Ethane	mg/L	N	0.000256	J	0.000555	J	NC
	Ethylene	mg/L	N	0.00139	J	0.00124		11.41
	Methane	mg/L	N	0.00165		0.00327		65.85
	Alkalinity	mg/L	N	5	U	5	U	NC
	Bromide	mg/L	N	1.26		1.32		4.65
	Chloride	mg/L	N	287		284		1.05
	Fluoride	mg/L	N	0.326		0.33		1.22
	Nitrate	mg/L	N	0.1	U	0.1	U	NC
	Nitrite	mg/L	N	0.1	U	0.2	U	NC
	Sulfate	mg/L	N	905		898		0.78
	Total organic carbon	mg/L	N	2.76		2.65		4.07
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	1,2-Dichloroethane	µg/L	N	0.5	U	0.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Vinyl chloride	µg/L	N	0.5	U	0.5	U	NC

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16WW25				Relative Percent Difference
			Sample Number	16WW25-190919		16WW25-190919-FD		
			Sample Date	09/19/2019		09/19/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	1,2-Dichloroethane	µg/L	N	0.5	U	0.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Vinyl chloride	µg/L	N	0.5	U	0.5	U	NC

			Location Code	16WW26				Relative Percent Difference
			Sample Number	16WW26-190917		16WW26-190917-FD		
			Sample Date	09/17/2019		09/18/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	1.4		1.6		13.33
	1,2-Dichloroethane	µg/L	N	0.5	U	0.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	35		36		2.82
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	380		440		14.63
	Vinyl chloride	µg/L	N	0.5	U	0.5	U	NC

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16WW31				Relative Percent Difference
			Sample Number	16WW31-181010		16WW31-181010-FD		
			Sample Date	10/10/2018		10/10/2018		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	31.45 - 31.55 ft		31.45 - 31.55 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	1,2-Dichloroethane	µg/L	N	0.5	U	0.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	0.5	U	0.5	U	NC
	Vinyl chloride	µg/L	N	0.5	U	0.5	U	NC

			Location Code	16WW40				Relative Percent Difference
			Sample Number	16WW40-181012		16WW40-181012-FD		
			Sample Date	10/12/2018		10/12/2018		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	12.31 - 12.56 ft		12.31 - 12.56 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	5.57		5.72		2.66
	Perchlorate	µg/L	N	2	U	2	U	NC
VOLATILES	1,1,2-Trichloroethane	µg/L	N	0.5	U	0.5	U	NC
	1,1-Dichloroethene	µg/L	N	3.5		3.5		0.00
	1,2-Dichloroethane	µg/L	N	3.8		3.8		0.00
	cis-1,2-Dichloroethene	µg/L	N	220		240		8.70
	Methylene chloride	µg/L	N	1	U	1	U	NC
	Trichloroethene	µg/L	N	660		640		3.08
	Vinyl chloride	µg/L	N	4.5		4.2		6.90

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16WW42				Relative Percent Difference
			Sample Number	16WW42-200310		16WW42-200310-FD		
			Sample Date	03/10/2020		03/10/2020		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
GEN CHEMISTRY	Bromide	mg/L	N	1.36		1.35		0.74
	Total organic carbon	mg/L	N	1.73		1.68		2.93

			Location Code	16WW58				Relative Percent Difference
			Sample Number	16WW58-190815		16WW58-190815-FD		
			Sample Date	08/15/2019		08/15/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
VOLATILES	1,1,2-Trichloroethane	µg/L	N	5	U	5	U	NC
	1,1-Dichloroethene	µg/L	N	5	U	5	U	NC
	1,2-Dichloroethane	µg/L	N	5	U	5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	78		76		2.60
	Methylene chloride	µg/L	N	10	U	10	U	NC
	Trichloroethene	µg/L	N	2,700		2,700		0.00
	Vinyl chloride	µg/L	N	5	U	5	U	NC

Appendix E Table 4: Summary of Field Duplicate Results

			Location Code	16WW58				Relative Percent Difference
			Sample Number	16WW58-190918		16WW58-190918-FD		
			Sample Date	09/18/2019		09/18/2019		
			Sample Purpose	REG		FD		
			Sample Type	GW		GW		
			Depth	0 - 0 ft		0 - 0 ft		
Test Group	Parameter	Units	Filtered	Result	VQ	Result	VQ	
DHC	Dehalococcoides	cells/mL	N	17.8		-NA-		0.00
GASES	Ethane	mg/L	N	0.000332	J	0.000318	J	NC
	Ethylene	mg/L	N	0.00151		0.00143		5.44
	Methane	mg/L	N	0.00362		0.00437		18.77
GEN CHEMISTRY	Alkalinity	mg/L	N	94		107		12.94
	Bromide	mg/L	N	3.52		3.48		1.14
	Nitrate	mg/L	N	0.1	U	0.1	U	NC
	Sulfate	mg/L	N	394		396		0.51
	Total organic carbon	mg/L	N	4.21		4.27		1.42
PERCHLORATE	Perchlorate	µg/L	N	2	U	2	U	NC
VOLATILES	1,1,2-Trichloroethane	µg/L	N	2.5	U	2.5	U	NC
	1,1-Dichloroethene	µg/L	N	3.9	J	3.9	J	NC
	1,2-Dichloroethane	µg/L	N	2.5	U	2.5	U	NC
	cis-1,2-Dichloroethene	µg/L	N	170		180		5.71
	Methylene chloride	µg/L	N	5	U	5	U	NC
	Trichloroethene	µg/L	N	4,300		4,100		4.76
	Vinyl chloride	µg/L	N	2.5	U	2.5	U	NC

Notes:

See Appendix E Table 2 for definitions of qualifiers.

µg/L - micrograms per liter

J - Estimated value.

U - Not detected; The analyte was analyzed for but not detected above the associated method detection limit.

mL - milliliter

FD - field duplicate

ft - feet

GW - groundwater

mg/L - milligrams per liter

NA - not applicable

NC - not calculated. Field precision results are calculated when target compounds are detected above the limit of quantitation in both primary and duplicate samples.

REG - regular sample

VQ - validation qualifiers

Appendix E Table 5: Technical Completeness

Analytical Method	Number of Analytes	Number of Samples	Number of Results	Number of Rejected Results	Number of Useable Results	Technical Completeness [Goal = 95 %] (percent)
Groundwater Environmental Samples						
CENSUS	1	21	21	0	21	100.%
SW6850	1	76	76	0	76	100.%
RSK-175	3	23	69	0	69	100.%
SM2320B	1	23	23	0	23	100.%
SM5310	1	124	124	0	124	100.%
SW8260	7	78	546	0	546	100.%
SW9056	6	140	223 [a]	0	223	100.%
Surface Water Environmental Samples						
SW6850	1	4	4	0	4	100.%
SW6020	5	4	20	0	20	100.%
SW8260	7	4	28	0	28	100.%

Notes:

[a] Total number of anion results are listed. Note that not every sample was analyzed for the full list of anions.

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • April 2021

Appendix F

Potentiometric Surface Maps

Shallow Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure F-1
Shallow Groundwater
Potentiometric Surface
October 2018
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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Shallow Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure F-2
Shallow Groundwater
Potentiometric Surface
June 2019
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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Shallow Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA, OKLAHOMA

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Figure F-3
Shallow Groundwater
Potentiometric Surface
September 2019
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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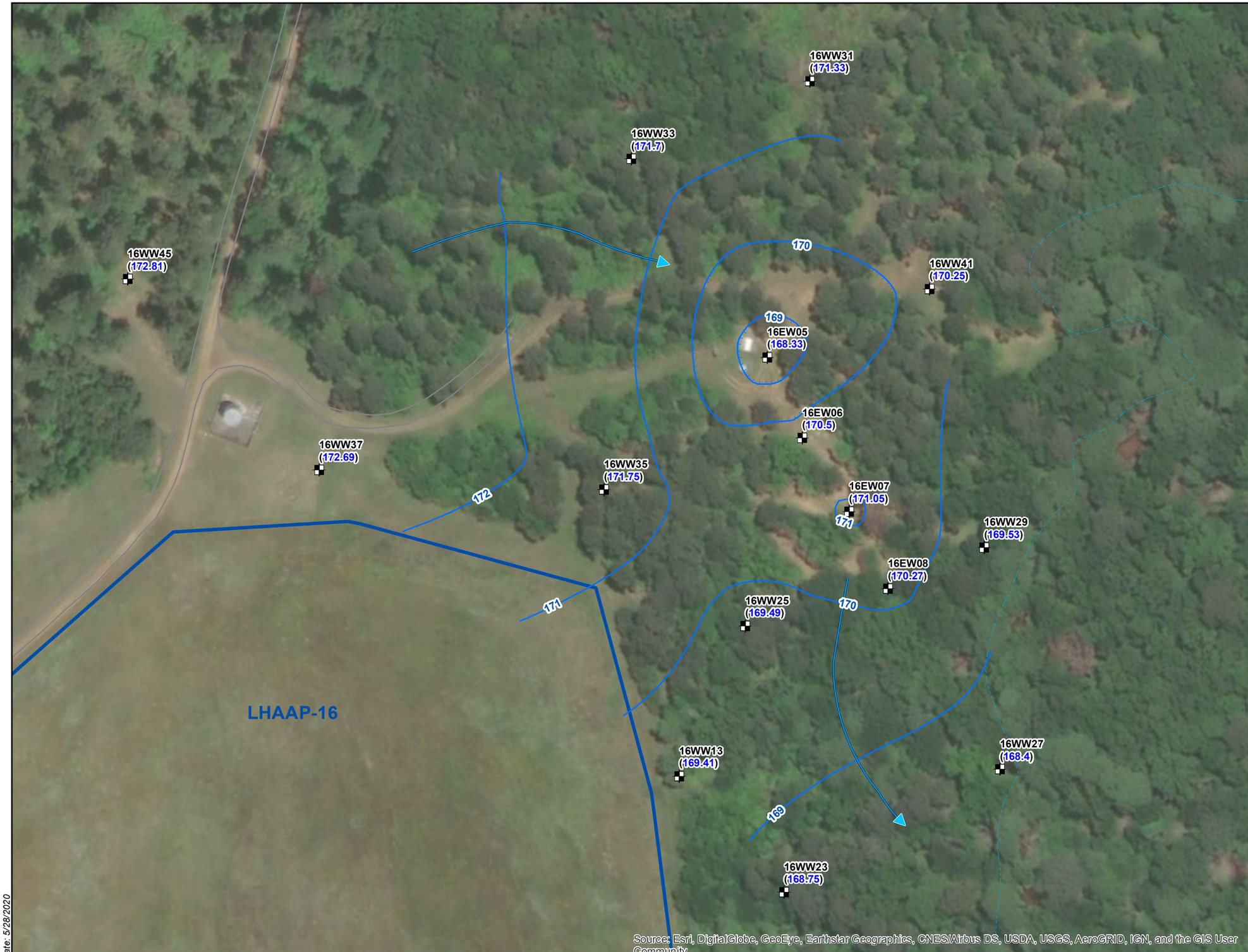

Intermediate Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Depression
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA, OKLAHOMA

bhate APTIM

Figure F-4
Intermediate Groundwater
Potentiometric Surface
October 2018
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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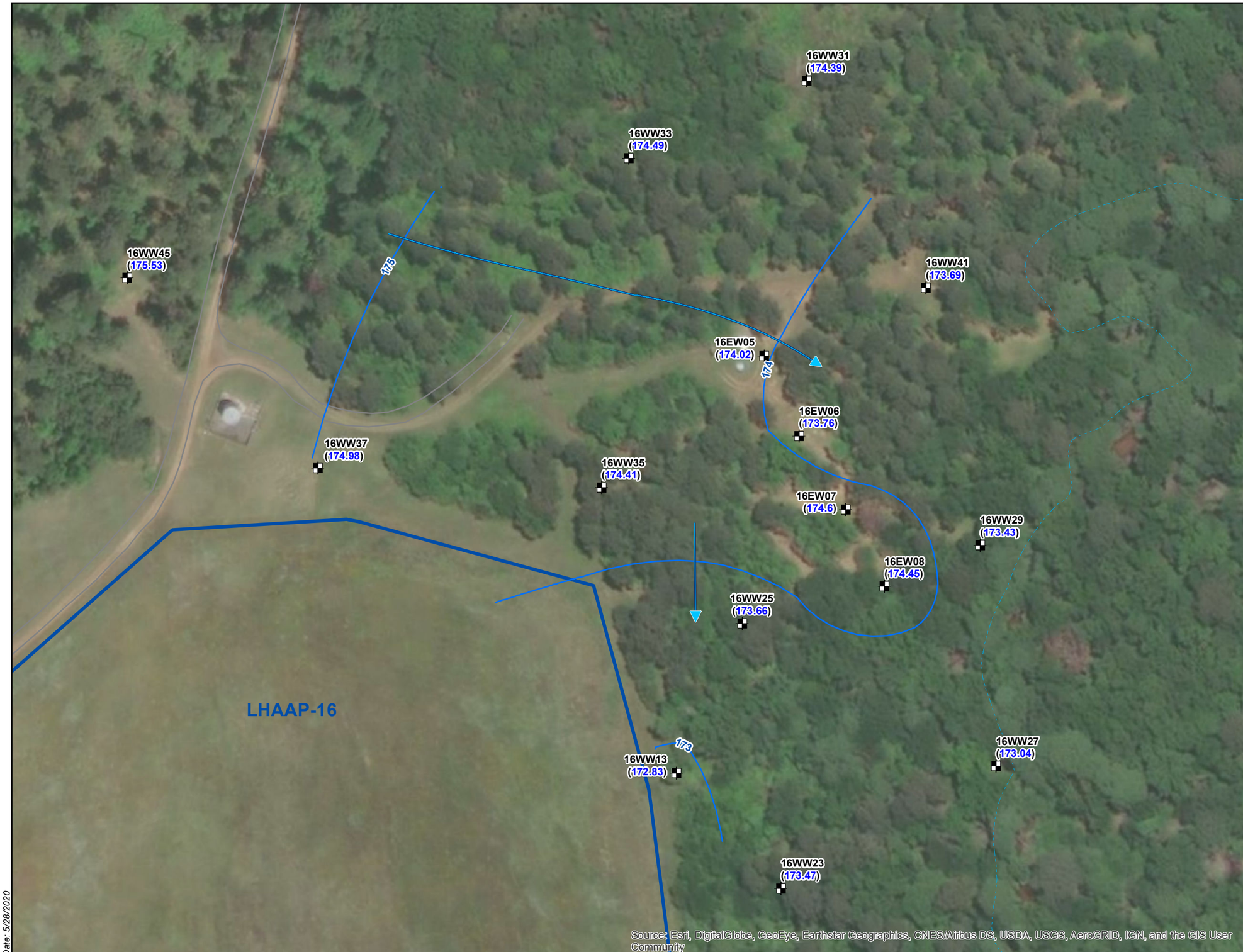

Intermediate Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA DISTRICT
TULSA, OKLAHOMA

bhate APTIM

Figure F-5
Intermediate Groundwater
Potentiometric Surface
June 2019
LHAAP-16 RACR
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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Intermediate Monitoring Well
Groundwater Flow Direction
Groundwater Contour
Stream
Road
LHAAP-16 Landfill Fence

Note:
1. Groundwater elevations are feet above mean sea level.

N

0 50 100
Feet

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TULSA, OKLAHOMA

bhate

APTIM

Figure F-6
Intermediate Groundwater
Potentiometric Surface
September 2019
LHAAP-16 RACR

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 5/28/2020

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Appendix G

Photographs

PHOTO LOG

Photo No.	Date	Task and Description
1	4-30-2018	Installation of Well 16IW30
2	8-2-2019	Looking west at drill rig set up on location of well 16WW57
3	8-2-2019	Looking southwest at well 16WW57 during drilling
4	9-24-2019	Injection trailer and mobile tank at Bayou Biobarrier
5	9-24-2019	Preparing to add zero valent iron to amendment at Bayou Biobarrier
6	9-27-2019	Grout failure at 16IW27
7	9-27-2019	Grout failure at 16IW28
8	10-2-2019	Fractionation tanks for storage of amendment water
9	10-2-2019	Staging area for intermediate bulk containers
10	10-5-2019	Injection rig at mid-plume area
11	10-5-2019	Mobile tank at mid-plume area
12	10-9-2019	Direct-push technology drill rig and intermediate bulk containers at Mid-Plume Shallow Biogrid
13	10-11-2019	Slabs and protective casings from 16IW27 and 16IW28 during their abandonment at mid-plume area.
14	10-18-2019	Recirculation storage tank for Mid-Plume Intermediate Biobarrier
15	10-18-2019	Mid-plume recirculation
16	10-19-2019	Direct-push technology drill rig at Landfill Biobarrier #3
17	11-21-2019	Injection at 16EW06 at Mid-Plume Intermediate Biobarrier
18	12-3-2019	Injection rig and horizontal tank at Landfill Biobarrier #2
19	12-3-2019	Extraction from 16EW14B for Landfill Biobarrier #2
20	12-20-2019	Injection at 16EW14B for Landfill Biobarrier #2

PHOTO 1: Installation of Well 16IW30
DATE: April 30, 2018

PHOTO 2: Looking west at drill rig set up on location of well 16WW57
DATE: August 2, 2019

PHOTO 3: Looking southwest at well 16WW57 during drilling
DATE: August 2, 2019

PHOTO 4: Injection trailer and mobile tank at Bayou Biobarrier
DATE: September 24, 2019

PHOTO 5: Preparing to add zero valent iron to amendment at Bayou Biobarrier
DATE: September 24, 2019

PHOTO 6: Grout failure at 16IW27
DATE: September 27, 2019

PHOTO 7: Grout failure at 16IW28
DATE: September 27, 2019

PHOTO 8: Fractionation tanks for storage of amendment water
DATE: October 2, 2019

PHOTO 9: Staging area for intermediate bulk containers
DATE: October 2, 2019 **VIEW**

PHOTO 10: Injection rig at mid-plume area
DATE: October 5, 2019

PHOTO 11: Mobile tank at mid-plume area
DATE: October 5, 2019

PHOTO 12: Direct-push technology drill rig and intermediate bulk containers at Mid-Plume Shallow Biogrid
DATE: October 9, 2019

PHOTO 13: Slabs and protective casings from 16IW27 and 16IW28 during their abandonment at mid-plume area.

DATE: October 11, 2019

PHOTO 14: Recirculation storage tank for Mid-Plume Intermediate Biobarrier

DATE: October 18, 2019

PHOTO 15: Mid-plume recirculation
DATE: October 18, 2019

PHOTO 16: Direct-push technology drill rig at Landfill Biobarrier #3
DATE: October 19, 2019

PHOTO 17: Injection at 16EW06 at Mid-Plume Intermediate Biobarrier
DATE: November 21, 2019

PHOTO 18: Injection rig and horizontal tank at Landfill Biobarrier #2
DATE: December 3, 2019

PHOTO 19: Extraction from 16EW14B for Landfill Biobarrier #2
DATE: December 3, 2019

PHOTO 20: Injection at 16EW14B for Landfill Biobarrier #2
DATE: December 20, 2019

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Phone: 925-288-2099

Fax:

Identifier: 017QB **Date Rec:** 02/07/2019 **Report Date:** 02/14/2019

Client Project #: 501032 **Client Project Name:** Longhorn AAP - LHAAP-16

Purchase Order #: 204818

Analysis Requested: CENSUS, Miscellaneous

Reviewed By:

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CENSUS

Client: **APTIM**
Project: Longhorn AAP - LHAAP-16

MI Project Number: **017QB**
Date Received: 02/07/2019

Sample Information

Client Sample ID:	**16WW56-190206**
Sample Date:	02/06/2019
Units:	cells/mL
Analyst/Reviewer:	JS

Dechlorinating Bacteria

Dehalococcoides	*DHC*	**3.80E+00**

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 **2/7/2019**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	02/07/2019	02/14/2019	1 °C	107%	non-detect	non-detect

01029099

APTIM

COC ID: LHAAP16-JAN2019-MI-~~1901~~ 190206

TURNAROUND TIME: normal

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	Microbial Insights, Inc.			Email Invoice To	fedinvoices@aptim.com		
Project Number	501032			Lab Contact	Customer Service						
Site	LHAAP-16			Email				Email Report To	Susan.Huang@aptim.com		
Address	1203-B East Grand Avenue			Address	10515 Research Drive			Mail Reports To	Susan Huang		
	PMB 202							Address	4005 Port Chicago Hwy		
City	Marshall	State	TX	City	Knoxville	State	TN	City	Concord	State	CA
Postal Code	75670	Country	USA	Postal Code	37932	Country	USA	Postal Code	94520	Country	USA
Phone Number	713.243.7264			Phone Number	865.573.8188						
Project Manager	Praveen Srivastav							Shipping Company			

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID/Number	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	DHC in Water (MI-DHC)								
								Sample Container and Preservative		1x1L HPDE, Ice								
16WW56-190206	LHAAP16	26.20	26.44		WG	2/6/19	1015	1		X				017Q31				
					WG													

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	[illegible] / BHATE	2/6/19 1400	[illegible] MI	2/7/19 1025

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Client: Kim Napier
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2410 Cherahala Blvd
Knoxville, TN 37932
United States

Phone:

Fax:

Identifier: 043PJ **Date Rec:** 10/11/2018 **Report Date:** 10/23/2018

Client Project #: 501032 **Client Project Name:** Longhorn AAP-LHAAP-16

Purchase Order #: 204818

Analysis Requested: CENSUS, Miscellaneous

Reviewed By:

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CENSUS

Client: **APTIM**
Project: Longhorn AAP-LHAAP-16

MI Project Number: **043PJ**
Date Received: 10/11/2018

Sample Information

Client Sample ID:		**16WW43-181009**	**16WW26-181009**	**16WW41-181009**	**16WW25-181009**	**16EW02-181009**
Sample Date:		10/09/2018	10/09/2018	10/09/2018	10/09/2018	10/09/2018
Units:		cells/mL	cells/mL	cells/mL	cells/mL	cells/mL
Analyst/Reviewer:		JS	JS	JS	JS	JS
Dechlorinating Bacteria						
Dehalococcoides	*DHC*	**2.10E+00**	**3.00E-01 (J)**	<5.00E-01	<5.00E-01	**2.00E-01 (J)**

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

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CENSUS

Client: **APTIM**
Project: Longhorn AAP-LHAAP-16

MI Project Number: **043PJ**
Date Received: 10/11/2018

Sample Information

Client Sample ID:		**16WW36-181009**	**16WW24-181009**	**16EW06-181009**	**16WW35-181010**	**16WW16-181010**
Sample Date:		10/09/2018	10/09/2018	10/09/2018	10/10/2018	10/10/2018
Units:		cells/mL	cells/mL	cells/mL	cells/mL	cells/mL
Analyst/Reviewer:		JS	JS	JS	JS	JS
Dechlorinating Bacteria						
Dehalococcoides	*DHC*	**2.02E+02**	**1.60E+00**	**1.70E+00**	**3.39E+01**	<5.00E-01

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

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CENSUS

Client: **APTIM**
Project: Longhorn AAP-LHAAP-16

MI Project Number: **043PJ**
Date Received: 10/11/2018

Sample Information

Client Sample ID:	**16WW22-181010**	**16WW29-181015**	**16WW55-181015**	**16WW48-181018**
Sample Date:	10/10/2018	10/15/2018	10/15/2018	10/18/2018
Units:	cells/mL	cells/mL	cells/mL	cells/mL
Analyst/Reviewer:	JS	JS	JS	JS

Dechlorinating Bacteria

Dehalococcoides	*DHC*	**5.20E+00**	**5.00E-01 (J)**	<5.00E-01	**3.00E-01 (J)**

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 10/11/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	10/11/2018	10/23/2018	0 °C	102%	non-detect	non-detect

Samples Received 10/16/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	10/16/2018	10/23/2018	0 °C	102%	non-detect	non-detect

Samples Received 10/19/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	10/19/2018	10/23/2018	0 °C	106%	non-detect	non-detect

APTIM

COC ID: LHAAP16-OCT2018-MI-181010 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	Microbial Insights, Inc.			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	Customer Service						
	LHAAP-50			Email				Email Report To	kim.napier@aptim.com		
Address	1203-B East Grand Avenue			Address	10515 Research Drive			Mail Reports To	Kim Napier		
	PMB 202							Address	2410 Cherahala Blvd.		
City	Marshall	State	TX	City	Knoxville	State	TN	City	Knoxville	State	TN
Postal Code	75670	Country	USA	Postal Code	37932	Country	USA	Postal Code	37932	Country	USA
Phone Number	713.243.7264			Phone Number	865.573.8188						
Project Manager	Praveen Srivastav							Shipping Company	UPS		

SAMPLE DETAILS / ANALYSIS REQUESTED

043PJ

	Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	DHC IN Water (mi-dhc)
1	16WW43-181009	16WW43	10.38	11.37	FT	GW	10/9/2018	949	1		1
2	16WW26-181009	16WW26	18.39	19.39	FT	GW	10/9/2018	1118	1		1
3	16WW41-181009	16WW41	27.73	28.24	FT	GW	10/9/2018	1125	1		1
4	16WW25-181009	16WW25	19.28	19.67	FT	GW	10/9/2018	1312	1		1
5	16EW02-181009	16EW02	24.4	24.59	FT	GW	10/9/2018	1340	1		1
6	16WW36-181009	16WW36	18.88	19.41	FT	GW	10/9/2018	1453	1		1
7	16WW24-181009	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	1		1
8	16EW06-181009	16EW06	24.15	24.33	FT	GW	10/9/2018	1455	1		1
9	16WW35-181010	16WW35	19.48	20.29	FT	GW	10/10/2018	1311	1		1
10	16WW16-181010	16WW16	23.28	23.43	FT	GW	10/10/2018	1315	1		1
11	16WW22-181010	16WW22	29.17	29.53	FT	GW	10/10/2018	1500	1		1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	APTIM	10-10-18/1600	MI	10/11/18 10:15

01029106

APTIM

COC ID: LHAAP16-OCT2018-MI-181015 | TURNAROUND TIME: normal | RUSH: | Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	Microbial Insights, Inc.			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	Customer Service						
	LHAAP-16			Email				Email Report To	kim.napier@aptim.com		
Address	1203-B East Grand Avenue			Address	10515 Research Drive			Mail Reports To	Kim Napier		
	PMB 202							Address	2410 Cherahala Blvd.		
City	Marshall	State	TX	City	Knoxville	State	TN	City	Knoxville	State	TN
Postal Code	75670	Country	USA	Postal Code	37932	Country	USA	Postal Code	37932	Country	USA
Phone Number	713.243.7264			Phone Number	865.573.8188						
Project Manager	Praveen Srivastav							Shipping Company	UPS		

SAMPLE DETAILS / ANALYSIS REQUESTED

	Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS: DHC IN Water (mi-dhc)
043PJ 12	16WW29-181015	16WW29	8.73	8.83	FT	GW	10/15/2018	930	1	1
13	16WW55-181015	16WW55	22.88	23.01	FT	GW	10/15/2018	1030	1	1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	[illegible] APTIM	10/15 @ 1520	[illegible] MI	10/16/18 1045

01029107

APTIM

COC ID: LHAAP16-OCT2018-MI-181018

TURNAROUND TIME: normal

RUSH:

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	Microbial Insights, Inc.			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	Customer Service						
	LHAAP-16			Email				Email Report To	kim.napier@aptim.com		
Address	1203-B East Grand Avenue			Address	10515 Research Drive			Mail Reports To	Kim Napier		
	PMB 202							Address	2410 Cherahala Blvd.		
City	Marshall	State	TX	City	Knoxville	State	TN	City	Knoxville	State	TN
Postal Code	75670	Country	USA	Postal Code	37932	Country	USA	Postal Code	37932	Country	USA
Phone Number	713.243.7264			Phone Number	865.573.8188						
Project Manager	Praveen Srivastav							Shipping Company	UPS		

SAMPLE DETAILS / ANALYSIS REQUESTED

043PJ
14

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	DHC IN Water (mi-dhc)
16WW48-181018	16WW48	11.87	11.95	FT	GW	10/18/2018	1240	1		1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	[illegible] APTIM	10/18/18 1630	[illegible] MI	10/19/18 1020

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Fax:

Identifier: 076QI **Date Rec:** 09/20/2019 **Report Date:** 09/27/2019

Client Project #: 501032 **Client Project Name:** LHAAP-16

Purchase Order #: 204818

Analysis Requested: CENSUS, Miscellaneous

Reviewed By:

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CENSUS

Client: **APTIM**
Project: LHAAP-16

MI Project Number: **076QI**
Date Received: 09/20/2019

Sample Information

Client Sample ID:	**16WW57-190918**	**16WW58-190918**
Sample Date:	09/18/2019	09/18/2019
Units:	cells/mL	cells/mL
Analyst/Reviewer:	HT	HT

Dechlorinating Bacteria

Dehalococcoides	*DHC*	**3.53E+01**	**1.78E+01**

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 **9/20/2019**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	09/20/2019	09/27/2019	1 °C	109%	non-detect	non-detect

01029111

APTIM

COC ID: LHAAP16-SEPT2019-MI-1909 [illegible]

TURNAROUND TIME: normal

RUSH:

PROJECT/CLIENT INFO			
Facility Name	Longhorn AAP		
Project Number	501032		
Site	LHAAP-16		
Address	1203-B East Grand Avenue		
	PMB 202		
City	Marshall	State	TX
Postal Code	75670	Country	USA
Phone Number	713.243.7264		
Project Manager	Praveen Srivastav		

LABORATORY			
Lab Name	Microbial Insights, Inc.		
Lab Contact	Customer Service		
Email			
Address	10515 Research Drive		
City	Knoxville	State	TN
Postal Code	37932	Country	USA
Phone Number	865.573.8188		

OTHER INFO			
Email Invoice To	fedinvoices@aptim.com		
Email Report To	Susan.Huang@aptim.com		
Mail Reports To	Susan Huang		
Address	4005 Port Chicago Hwy		
City	Concord	State	CA
Postal Code	94520	Country	USA
Shipping Company			

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID/Number	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS: DHC in Water (MI-DHC) (Sample Container and Preservative: 1x1L HPDE, Ice)								
16WW57-190916						9/16/19	1530	1	X				076QI1				
16WW58-1909						9/18/19	1409	1	X					2			
~~GFG-080519-LIZ~~						~~Lab~~	~~Lab~~	~~2~~									~~5~~

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	[illegible]	9/19/19 1530	[illegible] MI	9/20/19 1020

How to Retrieve and Use Estimated Percentile Ranks from the Microbial Insights Database

The MI Database

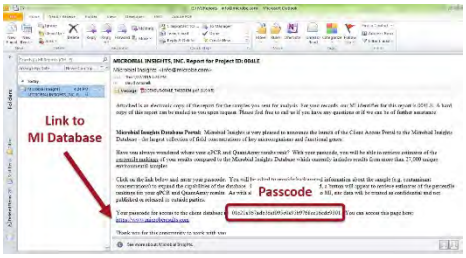
The Microbial Insights Database is the largest collection of field concentrations of key microorganisms and functional genes currently containing qPCR and QuantArray results for more than 40,000 unique groundwater, soil, and sediment samples from all 50 states and 33 countries worldwide.

Is that low, medium or high?

In practice, biodegradation depends not just on the presence but the actual concentrations of the contaminant degrading microorganisms. The estimated percentile ranks retrieved from the MI Database answer the question "Is that low, medium or high?" by comparing your results to those of the literally thousands of other environmental samples submitted to MI for analysis over the last 20+ years.

Retrieving Estimated Percentile Ranks

With your report, you were emailed a passcode and link enabling you to login to the Client Portal. Just enter basic information about the sample (e.g. contaminant concentrations) to aid in understanding the links between environmental conditions and microbial populations and you can retrieve estimates of the percentile ranks of your results based on those compiled in the MI database at no additional charge.



All site specific data will be treated as confidential and uploading is easy.

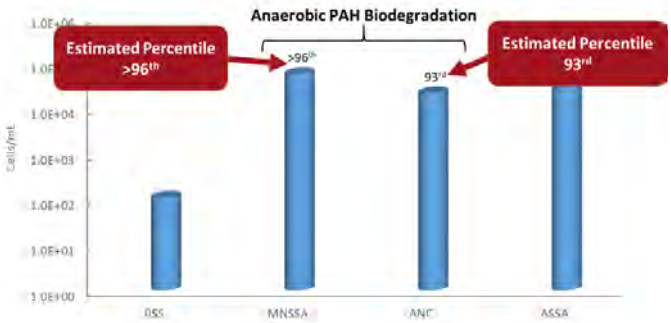
You can even upload chemical and geochemical data from EDDs. Just save as a Tab Delimited text file.

Example - Using Estimated Percentile for MNA Assessment at an MGP Site

CENSUS® qPCR was performed to quantify anaerobic naphthalene carboxylase (ANC) and naphthyl-2-methylsuccinate synthase (MNSSA) to assess anaerobic biodegradation of naphthalene and methyl-naphthalene under existing site conditions.

- Not only were ANC and MNSSA genes detected, but these functional genes responsible for anaerobic biodegradation of PAHs were present at concentrations "far better than average" based on the estimated percentile ranks.

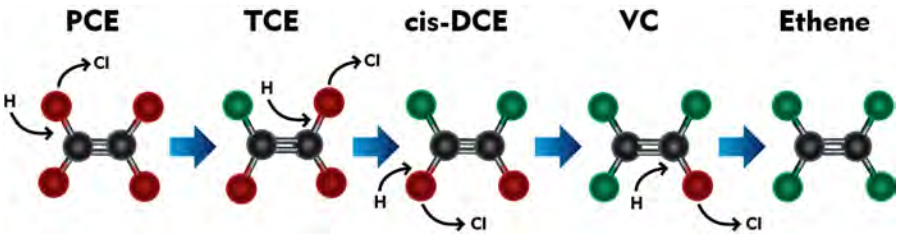
- Demonstrating high concentrations of ANC and MNSSA gave an additional line of evidence indicating growth substantial populations of anaerobic PAH degraders and suggested a greater probability that monitored natural attenuation (MNA) will be successful.



DHC Interpretation

Dehalococcoides 16S rRNA gene (qDHC)

Under anaerobic conditions, tetrachloroethene (PCE) and trichloroethene (TCE) can undergo sequential reductive dechlorination through the daughter products *cis*-dichloroethene (*cis*-DCE) and vinyl chloride to nontoxic ethene (1,2).



While a number of bacterial cultures capable of utilizing PCE and TCE as growth supporting electron acceptors have been isolated (3-7), *Dehalococcoides* spp. may be the most important because they are the only bacterial group that has been isolated to date which is capable of complete reductive dechlorination of PCE to ethene (8). In fact, the presence of *Dehalococcoides* spp. has been associated with complete dechlorination to ethene at sites across North America and Europe (9).

Status	*Dehalococcoides spp.*	Observation
	≥ 10^4 (cells/mL)	Lu et al. proposed that a concentration of 1 x 10^4 DHC cells/mL could be used as a screening criterion to identify sites where reductive dechlorination will yield a generally useful biodegradation rate (10). Similarly, in an internal study conducted with nearly 1000 groundwater samples obtained from sites across the US, ethene production was observed in approximately 80% of samples in which CENSUS® qDHC results were greater than or equal to 10^4 DHC cells/mL.
	10^1 to < 10^4 (cells/mL)	When vinyl chloride reductase genes (See DHC functional genes discussion below) are also detected, complete reductive dechlorination of PCE and TCE to ethene may still occur even with moderate DHC concentrations. When the DHC population is below the 10^4 cells/mL criterion proposed by Lu et al. (10), project managers should carefully consider other site-specific data to determine whether subsurface conditions may be limiting reductive dechlorination. For example, the addition of an electron donor may be able to stimulate DHC growth and enhance anaerobic bioremediation.
	< 10^1 (cells/mL)	DHC concentrations are low suggesting that complete reductive dechlorination of PCE and TCE to ethene is unlikely to occur under existing conditions. Enhanced anaerobic bioremediation options (biostimulation or bioaugmentation) may need to be considered.

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microbialinsights

DHC Interpretation

DHC Functional Genes (*tce*A, *bvc*A, *vcr*A)

A "stall" where daughter products *cis*-DCE and vinyl chloride accumulate can occur at PCE- and TCE-impacted sites especially under MNA conditions. The accumulation of vinyl chloride, generally considered more carcinogenic than the parent compounds, is particularly problematic. Although elevated *Dehalococcoides* concentrations correspond to ethene production in numerous studies, the range of chlorinated ethenes metabolized and cometabolized varies among species and strains within the *Dehalococcoides* genus. For example, *Dehalococcoides ethenogenes* str. 195 metabolizes PCE, TCE, and *cis*-DCE and cometabolizes vinyl chloride (8) to produce ethene. Conversely, *Dehalococcoides* sp. CBDB1 utilizes PCE and TCE but does not cometabolize additional chloroethenes (11). Other *Dehalococcoides* strains, such as BAV1, GT and VS, are known to fully dechlorinate cis-DCE and VC to ethene (14,16,19). Quantification of reductive dehalogenase genes is used to more definitively confirm the potential for reductive dechlorination of TCE, cis-DCE, and vinyl chloride (12-15).

Functional Gene	Observation
TCE Reductase	
***tce*A gene**	The *tce*A gene encodes the enzyme responsible for reductive dechlorination of TCE to *cis*-DCE in some strains of *Dehalococcoides*. Absence of *tce*A does not preclude the potential for reductive dechlorination of TCE in the field since the *tce*A gene is not universally distributed among all DHC and is not present in other microorganisms capable of reductive dechlorination of TCE (e.g. *Dehalobacter*). Detection of the *tce*A gene provides an additional line of evidence indicating the potential for dechlorination of TCE.
Vinyl Chloride Reductase	
***bvc*A gene**	The *bvc*A gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of vinyl chloride to ethene by *Dehalococcoides* sp. str. BAV1 (16). Presence of *bvc*A gene indicates the potential for reductive dechlorination of VC to ethene. Absence of both *bvc*A and *vcr*A genes suggests VC may accumulate. An internal study with ~1,000 samples showed ethene production was observed in 80% of the samples that the DHC population was greater than or equal to 10^4 cells/mL. The *bvc*A gene was detected in over 50% of these samples. Van Der Zaan et al (17) noted that the bvcA gene was the only VC reductase gene detected at three of their sites. Alfred Spormann's laboratory at Stanford University (18) reported that the *bvc*A gene was the most abundant and active at the outflow of a PCE fed column study. This section of the column was in the DCE to VC stages of reductive dechlorination thus confirming the importance of the *bvc*A gene for complete reductive dechlorination.
***vcr*A gene**	The *vcr*A gene encodes the vinyl chloride reductase enzyme responsible for reductive dechlorination of *cis*-DCE and vinyl chloride by *Dehalococcoides* sp. strain VS (14). Presence of *vcr*A gene indicates the potential for reductive dechlorination of DCE and/or VC to ethene. Absence of both *bvc*A and *vcr*A genes suggest VC may accumulate. As with the *bvc*A gene, detection of the *vcr*A gene is associated with ethene production in internal studies (67%) and vinyl chloride reduction in independent studies (14, 17).

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DHC Interpretation

Reporting

Microbial Insights can provide a variety of data packages and reporting levels to suit the needs of any project. Data packages range from simple analytical reports with results only to more complex data packages that include a report narrative, analytical results, QC data, and supporting materials including all raw data and chain-of-custody documentation. The figure below shows our standard report and explains the way values are reported.

Microbial Insights, Inc.

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CENSUS

Client: Company Name
Project: Your Project Name

MI Project Number: Unique Laboratory Identifier
Date Received: Date Samples Arrived

Sample Information

Client Sample ID:		Sample A	Sample B	Sample C
Sample Date:		00/00/0000	00/00/0000	00/00/0000
Units:		cells/mL	cells/mL	cells/mL
Analyst:		Intials	Intials	Intials
Dechlorinating Bacteria				
Dehalococcoides spp.	DHC	**1.84E+05**	**2.76E+02**	**2.28E+01 (J)**
Functional Genes				
tceA Reductase	TCE	**6.00E+01**	**3.23E+01**	<4.00E-01
bvcA Reductase	BVC	**1.17E+04**	**1.81E+01**	<4.00E-01
vcrA Reducatase	VCR	**8.42E+04**	**1.74E+02**	<4.00E-01

"J" value
Result is an estimated value. This data qualifier (flag) is used when the target gene is detected but at a concentration or abundance below the practical quantification limit (PQL).

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

< value
The target gene was not detected at the limit of quantitation (LOQ) reported for that sample.

"I" value
QA Procedure indicated that the sample may have exhibited PCR inhibition. Although relatively rare, PCR inhibition can occur due to the presence of metals or humic acids at high concentrations in the sample.

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DHC Interpretation

Quality Assurance

Microbial Insights' comprehensive Quality Assurance (QA) Program is the foundation of all laboratory analyses, ensuring that our clients receive high-quality analytical services that are timely, reliable, and meet their intended purpose in a cost effective manner. MI is committed to providing quality data that surpasses regulatory and industry standards, thus enabling the client to make well-informed decisions. MI maintains strict standard operating procedures and QA/QC measures throughout all of the analyses offered. The following Table details specific QA/QC procedures that are used for CENSUS.

QA/QC	Description
Date of Extraction	DNA and RNA extractions are performed the day the samples are received by MI to minimize the possibility of any changes to the microbial community prior to analysis.
Laboratory Method Blanks	An extraction blank (no sample added) is processed alongside each set of field samples from DNA extraction through CENSUS® analysis to ensure that cross contamination has not occurred. Although MI has never experienced this issue, the detection of the CENSUS® target (e.g. *Dehalococcoides*) in an extraction blank is direct evidence of cross contamination with a sample or contamination of a reagent and would invalidate the results. If this were to occur, MI would re-extract the sample. If not possible to re-extract, MI would contact the client immediately and notate it on the laboratory report.
Laboratory Control Samples (LCS)	A laboratory control sample (LCS) or positive control (target DNA) is included with each CENSUS® plate to confirm amplification and as a continuing calibration check.
Negative Controls	A negative control (no DNA) is included with each CENSUS plate to ensure that cross contamination has not occurred during amplification. As with the extraction blank, detection of CENSUS target (e.g. DHC) in a negative control is direct evidence of contamination and would invalidate the results. If this were to occur, MI would rerun the analysis.

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How to Use Estimated Percentile Ranks from the Microbial Insights Database

The MI Database and Client Portal

The Microbial Insights Database is the largest collection of field concentrations of key microorganisms and functional genes currently containing qPCR and QuantArray results for more than 32,000 unique groundwater, soil, and sediment samples from all 50 states and 33 countries worldwide. Driven by field samples, the database reflects the impacts of common contaminants, geochemical conditions, and site management practices on critical microbial populations.

With your report, you received a passcode enabling you to retrieve estimates of the percentile ranks of your results based on those compiled in the MI database at no additional charge. When accessing the database, you will be asked to provide background information about the sample (e.g. contaminant concentrations) to aid in understanding the links between environmental conditions and microbial populations. As with all client information provided to MI, site specific data will be treated as confidential.

Is that low, medium or high?

In practice, biodegradation depends not just on the presence but the actual concentrations of the contaminant degrading microorganisms. Simply put, qPCR and QuantArray results demonstrating high concentrations of target microorganisms or functional genes suggest in situ selection, enrichment and growth of those specific contaminant degraders and therefore a greater probability that monitored natural attenuation (MNA) or bioremediation will be successful.

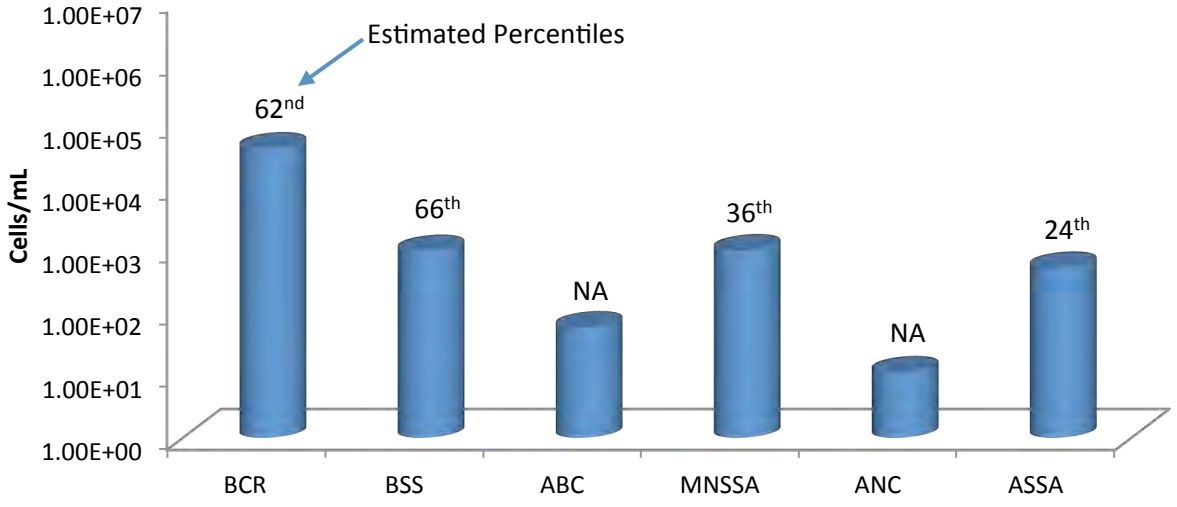
Is that a low, medium, or high concentration? The estimated percentile ranks retrieved from the MI Database answer that question by comparing your qPCR and QuantArray results to those of the literally thousands of other environmental samples submitted to MI for analysis over the last 20+ years.

Using the Estimated Percentile - Interpretation Examples

MNA Assessment – Petroleum Hydrocarbon Site:

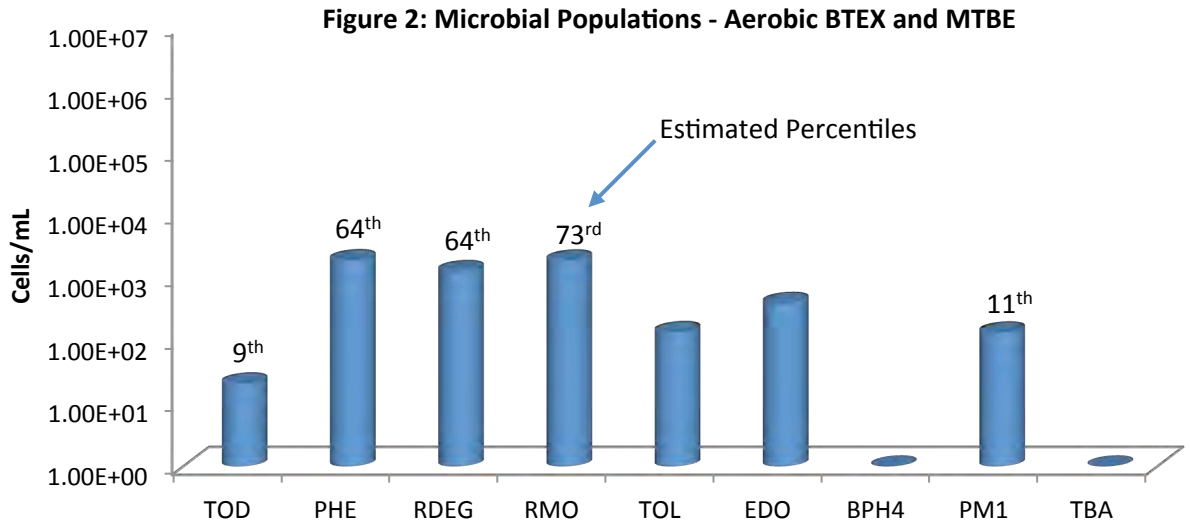
Whenever possible, interpretation of qPCR and QuantArray results should include comparisons between samples obtained from background and impacted wells. The estimated percentile ranks however provide an additional avenue for comparison and evaluation of treatment options as shown below.

Figure 1: Microbial Populations - Anaerobic BTEX and PAHs



Anaerobic BTEX and PAH Biodegradation (Figure 1):

- With moderate concentrations of functional genes involved in anaerobic BTEX metabolism detected, the QuantArray-Petro® results were encouraging in terms of evaluating biodegradation potential under existing site conditions.
- More specifically, benzylsuccinate synthase (BSS) was detected on the order of nearly 10^3 cells/mL indicating the presence of a substantial population (66th percentile) capable of anaerobic biodegradation of toluene and other alkyl substituted benzenes.
- Naphthyl-2-methylsuccinate synthase (MNSSA) and alkylsuccinate synthase (ASSA) genes were also detected indicating the potential for anaerobic biodegradation of 2-methylnaphthalene and normal alkanes.
- The concentration of MNSSA genes would be considered modest with an estimated percentile of 36th.
- While the percentile rank for MNSSA would be "below average", a number of additional factors should be considered.
    - First, anaerobic hydrocarbon degraders are less prevalent than aerobic BTEX degraders and overall detection frequencies for many genes involved in anaerobic hydrocarbon biodegradation are less than 50%.
    - Therefore, the detection of genes like BSS, MNSSA, ASSA, anaerobic benzene carboxylase (ABC), and anaerobic naphthalene carboxylase (ANC) even at low concentrations is certainly noteworthy and inherently "better than average".
    - The estimated percentiles for all assays are based only on samples where the concentration of the target gene was greater than the practical quantitation limit (PQL).
    - For less commonly detected targets like many of the genes involved in anaerobic hydrocarbon biodegradation this is an especially important consideration.
    - Excluding samples where a gene target is below the PQL ensured that the median concentrations of less commonly detected targets would not be unduly biased low by the fact that the gene is not detected in most samples.
- Anaerobic benzene carboxylase (ABC) and naphthalene carboxylase (ANC) genes were also detected indicating the presence of bacterial populations capable of anaerobic biodegradation of benzene and naphthalene.
- For newly identified genes like ABC and ANC, estimated percentile ranks are not yet available due to the limited number of field samples that have been analyzed to date.
- However, like MNSSA and other genes involved in anaerobic hydrocarbon biodegradation, ABC and ANC detection frequencies are relatively low so the detection of these genes even at low concentrations should be considered when evaluating biodegradation potential under existing site conditions.

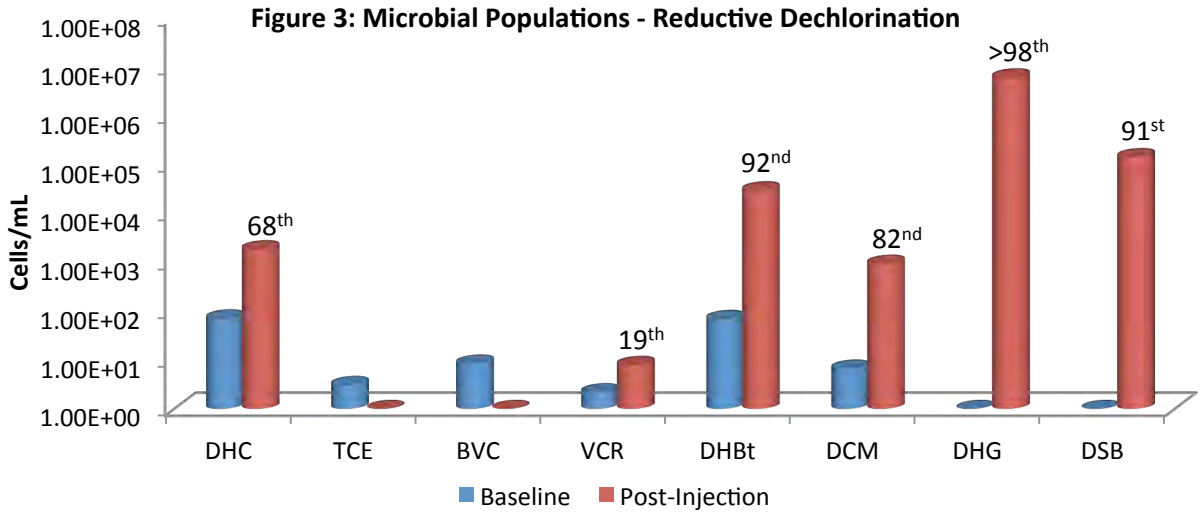


Aerobic BTEX and MTBE Biodegradation (Figure 2):

- With growing evidence that aromatic oxygenases function at low dissolved oxygen concentrations, aerobic BTEX biodegradation pathways should also be evaluated when considering MNA.
- Again, the QuantArray-Petro results were encouraging – genes encoding the first step in multiple pathways for aerobic BTEX biodegradation were detected indicating the presence of a diverse population of aerobic BTEX degraders.
- However, aerobic BTEX degraders are often considered ubiquitous. Therefore answering the question "Is that low, medium or high?" becomes especially important when evaluating aerobic BTEX biodegradation at petroleum hydrocarbon sites.
- In this case, the estimated percentile ranks of the concentrations of toluene/benzene monooxygenase (RMO and RDEG) and phenol hydroxylase (PHE) genes ranged from the 64th to 73rd percentile.
- In other words, the concentrations of RMO, RDEG, and PHE detected in this groundwater sample were greater than the concentrations detected in 64% to 73% of all other groundwater samples where these genes were analyzed and detected above the PQL.
- Aerobic BTEX degraders are common in the environment, but in this sample concentrations of toluene/benzene monooxygenase genes could be viewed as "better than average" when compared to the MI Database.

Biostimulation – Chlorinated Solvent Site:

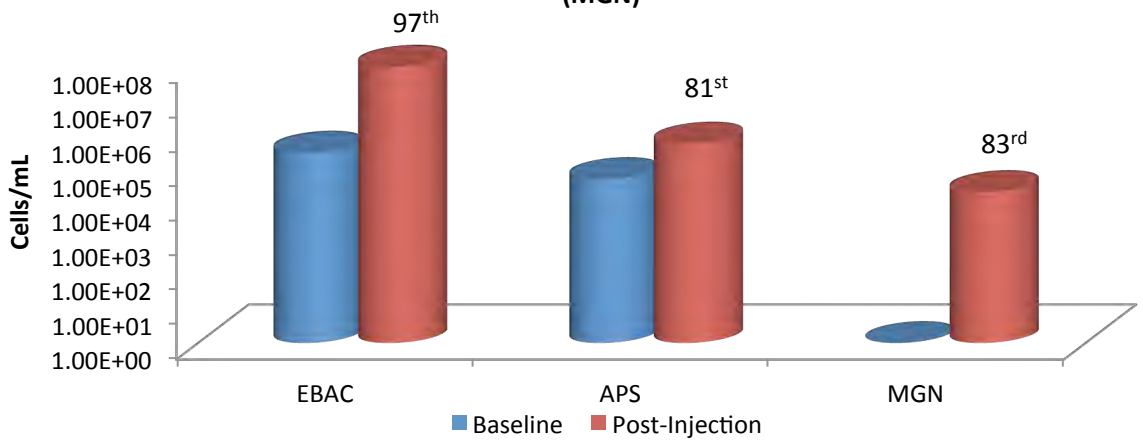
Whenever possible, interpretation of qPCR and QuantArray results should include comparisons between baseline and post-injection monitoring events as shown below (Figure 3). The estimated percentile ranks however provide an additional avenue for comparison and evaluation of remedy performance.



- During the baseline groundwater sampling event, *Dehalococcoides* and vinyl chloride reductase genes were detected indicating the potential for complete reductive dechlorination of PCE and TCE to ethene.
- However, the *Dehalococcoides* concentration was well below the 10^4 cells/mL recommended by Lu et al. (2006) for generally effective rates of reductive dechlorination.
- Based on qPCR results as well as traditional groundwater monitoring, biostimulation with electron donor addition was selected as the site management plan.
- By the first monitoring event after injection, populations of halorespiring bacteria had increased substantially in response to electron donor addition.
    - *Dehalobacter* populations increased by more than two orders of magnitude to post-injection concentrations greater than 10^4 cells/mL (92nd percentile).
    - *Dehalogenimonas* (10^6 cells/mL) and *Desulfitobacterium* (10^5 cells/mL) which had not been detected prior electron donor addition were present at concentrations greater than observed in over 90% of other groundwater samples where these halorespiring bacteria were detected.
- After injection, *Dehalococcoides* populations increased by more than an order of magnitude to a concentration of over 10^3 cells/mL (68th percentile) demonstrating growth of this key group of halorespiring bacteria.
- Despite a substantial increase and a "better than average" concentration, the *Dehalococcoides* population was still below the 10^4 cells/mL threshold and vinyl chloride reductase gene copies were low (19th percentile).
    - In terms of electron donors and acceptors, the metabolic capabilities of *Dehalococcoides* are rather specialized (hydrogen utilizing obligate halorespiring bacteria) so the median concentration is low. With a low median concentration across the database, a "better than average" *Dehalococcoides* concentration in a given sample may not exceed the 10^4 cells/mL threshold established for effective reductive dechlorination (Lu et al. 2006) and ethene production (Microbial Insights, unpublished data).

- In this case, the initial growth of *Dehalococcoides* was substantial but may have been somewhat hindered by competition with sulfate reducing bacteria (Figure 4 below).
    - The baseline population of sulfate reducing bacteria was moderate (10^4 cells/mL; 63rd percentile). Consistent with an observed decreased in dissolved sulfate concentrations, populations of sulfate reducing bacteria increased and were detected at a relatively high concentration (81st percentile) after electron donor addition.
    - After injection, methanogen populations also increased to a relatively high concentration (83rd percentile) suggesting generation of methanogenic conditions.
- With sulfate depletion and generation of highly anaerobic conditions more conducive to reductive dechlorination, *Dehalococcoides* populations may continue to increase and exceed the 10^4 *Dehalococcoides* cells/mL threshold in subsequent monitoring events.
- Overall, QuantArray analysis conclusively demonstrated that electron donor addition stimulated growth of halorespiring bacteria with the estimated percentiles retrieved from the MI Database providing the "low, medium or high" perspective to the observed changes in microbial populations.

Figure 4: Total Bacteria (EBAC), Sulfate Reducering Bacteria (APS) and Methanogens (MGN)



References

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March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100492**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 10 sample(s) on Oct 10, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100492

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100492-01	16TB01-181009	Water	VBLKW 092618-22	09-Oct-2018 00:00	10-Oct-2018 09:15	☐
HS18100492-02	16WW43-181009	Water		09-Oct-2018 09:49	10-Oct-2018 09:15	☐
HS18100492-03	16WW26-181009	Water		09-Oct-2018 11:18	10-Oct-2018 09:15	☐
HS18100492-04	16WW41-181009	Water		09-Oct-2018 11:25	10-Oct-2018 09:15	☐
HS18100492-05	16WW25-181009	Water		09-Oct-2018 13:12	10-Oct-2018 09:15	☐
HS18100492-06	16EW02-181009	Water		09-Oct-2018 13:40	10-Oct-2018 09:15	☐
HS18100492-07	16WW36-181009	Water		09-Oct-2018 14:53	10-Oct-2018 09:15	☐
HS18100492-08	16WW24-181009	Water		09-Oct-2018 14:45	10-Oct-2018 09:15	☐
HS18100492-09	16WW24-181009-FD	Water		09-Oct-2018 14:45	10-Oct-2018 09:15	☐
HS18100492-10	16EW06-181009	Water		09-Oct-2018 14:55	10-Oct-2018 09:15	☐

Revision:1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100492

CASE NARRATIVE

Work Order Comments

- Revised to update the VOC list.
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.
- The analysis for Total Organic Carbon was subcontracted to ALS Kelso, WA. Final report attached.

GC Semivolatiles by Method RSK-175

Batch ID: R325683

Sample ID: 16WW24-181009 (HS18100492-08MS)

- 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: 16WW24-181009 (HS18100492-08MSD)

- 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.

GCMS Volatiles by Method SW8260

Batch ID: R325746

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Batch ID: R325554

Sample ID: CCV

- 2,2-Dichloropropane and Bromomethane exceeded %D limits on CCV. Samples ND.

Sample ID: 16WW24-181009 (HS18100492-08MS)

- MS and/or MSD recovered outside control limits for Dichlorodifluoromethane and 1,2-Dibromo-3-chloropropane

WetChemistry by Method SM2320B

Batch ID: R325372

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R325252

Sample ID: 16WW24-181009 (HS18100492-08MS)

- The MS and/or MSD recovery was outside of the control limits; however, the result in the parent sample is greater than 4x the spike amount. (Chloride,Sulfate)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100492

CASE NARRATIVE

WetChemistry by Method SW9056

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16TB01-181009
Collection Date: 09-Oct-2018 00:00

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-01
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Oct-2018 13:13
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:13
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:13
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:13
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	16-Oct-2018 13:13
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:13
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:13
Surr: 1,2-Dichloroethane-d4	*91.1*			**0**	*70-126*	*%REC*	*1*	*16-Oct-2018 13:13*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*81-113*	*%REC*	*1*	*16-Oct-2018 13:13*
Surr: Dibromofluoromethane	*95.9*			**0**	*77-123*	*%REC*	*1*	*16-Oct-2018 13:13*
Surr: Toluene-d8	*93.2*			**0**	*82-127*	*%REC*	*1*	*16-Oct-2018 13:13*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW43-181009
Collection Date: 09-Oct-2018 09:49

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-02
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Oct-2018 20:08
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:08
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:08
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:08
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	16-Oct-2018 20:08
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:08
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:08
Surr: 1,2-Dichloroethane-d4	*91.0*			**0**	*70-126*	*%REC*	*1*	*16-Oct-2018 20:08*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*81-113*	*%REC*	*1*	*16-Oct-2018 20:08*
Surr: Dibromofluoromethane	*99.3*			**0**	*77-123*	*%REC*	*1*	*16-Oct-2018 20:08*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*16-Oct-2018 20:08*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	0.00100	U	0.000144	0.00100	0.00100	mg/L	1	16-Oct-2018 12:35
Ethene	**0.00228**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 12:35
Methane	**0.133**		**0.000535**	**0.00250**	**0.00250**	**mg/L**	5	16-Oct-2018 12:58
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**104**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:00
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**0.173**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 01:11
Chloride	**31.7**		**0.200**	**0.500**	**0.500**	**mg/L**	1	11-Oct-2018 01:11
Fluoride	**0.181**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 01:11
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 01:11
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 01:11
Sulfate	**6.35**		**0.200**	**0.500**	**0.500**	**mg/L**	1	11-Oct-2018 01:11
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW26-181009
Collection Date: 09-Oct-2018 11:18

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-03
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	2.5	U	1.5	2.5	5.0	ug/L	5	18-Oct-2018 20:11
1,1-Dichloroethene	2.5	U	1.0	2.5	5.0	ug/L	5	18-Oct-2018 20:11
1,2-Dichloroethane	2.5	U	1.0	2.5	5.0	ug/L	5	18-Oct-2018 20:11
cis-1,2-Dichloroethene	**290**		**1.0**	**2.5**	**5.0**	**ug/L**	5	18-Oct-2018 20:11
Methylene chloride	5.0	U	5.0	5.0	10	ug/L	5	18-Oct-2018 20:11
Trichloroethene	**2,400**		**5.0**	**12**	**25**	**ug/L**	25	18-Oct-2018 20:38
Vinyl chloride	**5.0**	J	**1.0**	**2.5**	**5.0**	**ug/L**	5	18-Oct-2018 20:11
Surr: 1,2-Dichloroethane-d4	*88.0*			**0**	*70-126*	*%REC*	*25*	*18-Oct-2018 20:38*
Surr: 1,2-Dichloroethane-d4	*91.3*			**0**	*70-126*	*%REC*	*5*	*18-Oct-2018 20:11*
Surr: 4-Bromofluorobenzene	*96.6*			**0**	*81-113*	*%REC*	*5*	*18-Oct-2018 20:11*
Surr: 4-Bromofluorobenzene	*99.0*			**0**	*81-113*	*%REC*	*25*	*18-Oct-2018 20:38*
Surr: Dibromofluoromethane	*97.0*			**0**	*77-123*	*%REC*	*5*	*18-Oct-2018 20:11*
Surr: Dibromofluoromethane	*95.3*			**0**	*77-123*	*%REC*	*25*	*18-Oct-2018 20:38*
Surr: Toluene-d8	*91.7*			**0**	*82-127*	*%REC*	*5*	*18-Oct-2018 20:11*
Surr: Toluene-d8	*92.8*			**0**	*82-127*	*%REC*	*25*	*18-Oct-2018 20:38*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000591**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 15:57
Ethene	**0.00259**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 15:57
Methane	**0.0105**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 15:57
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**12.0**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:05
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 01:40
Chloride	**163**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 01:54
Fluoride	**0.128**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 01:40
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 01:40
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 01:40
Sulfate	**1,170**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 01:54
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW41-181009
Collection Date: 09-Oct-2018 11:25

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-04
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	18-Oct-2018 21:59
1,1-Dichloroethene	**17**		**2.0**	**5.0**	**10**	**ug/L**	10	18-Oct-2018 21:59
1,2-Dichloroethane	5.0	U	2.0	5.0	10	ug/L	10	18-Oct-2018 21:59
cis-1,2-Dichloroethene	**1,200**		**2.0**	**5.0**	**10**	**ug/L**	10	18-Oct-2018 21:59
Methylene chloride	10	U	10	10	20	ug/L	10	18-Oct-2018 21:59
Trichloroethene	**9,800**		**20**	**50**	**100**	**ug/L**	100	18-Oct-2018 22:26
Vinyl chloride	**110**		**2.0**	**5.0**	**10**	**ug/L**	10	18-Oct-2018 21:59
Surr: 1,2-Dichloroethane-d4	*90.1*			**0**	*70-126*	*%REC*	*100*	*18-Oct-2018 22:26*
Surr: 1,2-Dichloroethane-d4	*92.4*			**0**	*70-126*	*%REC*	*10*	*18-Oct-2018 21:59*
Surr: 4-Bromofluorobenzene	*97.2*			**0**	*81-113*	*%REC*	*10*	*18-Oct-2018 21:59*
Surr: 4-Bromofluorobenzene	*98.3*			**0**	*81-113*	*%REC*	*100*	*18-Oct-2018 22:26*
Surr: Dibromofluoromethane	*97.4*			**0**	*77-123*	*%REC*	*10*	*18-Oct-2018 21:59*
Surr: Dibromofluoromethane	*94.1*			**0**	*77-123*	*%REC*	*100*	*18-Oct-2018 22:26*
Surr: Toluene-d8	*90.6*			**0**	*82-127*	*%REC*	*10*	*18-Oct-2018 21:59*
Surr: Toluene-d8	*92.1*			**0**	*82-127*	*%REC*	*100*	*18-Oct-2018 22:26*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000281**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 16:09
Ethene	**0.00304**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 16:09
Methane	**0.00655**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 16:09
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**951**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:13
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.35**		**0.600**	**2.00**	**2.00**	**mg/L**	20	11-Oct-2018 02:23
Chloride	**733**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 02:23
Fluoride	**0.204**		**0.100**	**0.200**	**0.200**	**mg/L**	2	11-Oct-2018 02:09
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 02:09
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 02:09
Sulfate	**9,260**		**40.0**	**100**	**100**	**mg/L**	200	11-Oct-2018 14:53
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW25-181009
Collection Date: 09-Oct-2018 13:12

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-05
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Oct-2018 20:33
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:33
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:33
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:33
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	16-Oct-2018 20:33
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:33
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 20:33
Surr: 1,2-Dichloroethane-d4	*92.1*			**0**	*70-126*	*%REC*	*1*	*16-Oct-2018 20:33*
Surr: 4-Bromofluorobenzene	*97.8*			**0**	*81-113*	*%REC*	*1*	*16-Oct-2018 20:33*
Surr: Dibromofluoromethane	*97.1*			**0**	*77-123*	*%REC*	*1*	*16-Oct-2018 20:33*
Surr: Toluene-d8	*91.1*			**0**	*82-127*	*%REC*	*1*	*16-Oct-2018 20:33*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000316**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 16:58
Ethene	**0.000954**	J	**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 16:58
Methane	**0.0137**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 16:58
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**69.0**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:19
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.86**		**0.600**	**2.00**	**2.00**	**mg/L**	20	11-Oct-2018 03:22
Chloride	**489**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 03:22
Fluoride	**0.0660**	J	**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 03:07
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 03:07
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 10:46
Sulfate	**5,710**		**40.0**	**100**	**100**	**mg/L**	200	11-Oct-2018 15:07
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16EW02-181009
Collection Date: 09-Oct-2018 13:40

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-06
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	25	U	15	25	50	ug/L	50	18-Oct-2018 22:51
1,1-Dichloroethene	**100**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 22:51
1,2-Dichloroethane	25	U	10	25	50	ug/L	50	18-Oct-2018 22:51
cis-1,2-Dichloroethene	**16,000**		**100**	**250**	**500**	**ug/L**	500	18-Oct-2018 23:18
Methylene chloride	50	U	50	50	100	ug/L	50	18-Oct-2018 22:51
Trichloroethene	**24,000**		**100**	**250**	**500**	**ug/L**	500	18-Oct-2018 23:18
Vinyl chloride	**470**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 22:51
Surr: 1,2-Dichloroethane-d4	*93.1*			**0**	*70-126*	*%REC*	*50*	*18-Oct-2018 22:51*
Surr: 1,2-Dichloroethane-d4	*90.1*			**0**	*70-126*	*%REC*	*500*	*18-Oct-2018 23:18*
Surr: 4-Bromofluorobenzene	*96.7*			**0**	*81-113*	*%REC*	*50*	*18-Oct-2018 22:51*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*81-113*	*%REC*	*500*	*18-Oct-2018 23:18*
Surr: Dibromofluoromethane	*95.9*			**0**	*77-123*	*%REC*	*50*	*18-Oct-2018 22:51*
Surr: Dibromofluoromethane	*96.7*			**0**	*77-123*	*%REC*	*500*	*18-Oct-2018 23:18*
Surr: Toluene-d8	*91.4*			**0**	*82-127*	*%REC*	*50*	*18-Oct-2018 22:51*
Surr: Toluene-d8	*92.0*			**0**	*82-127*	*%REC*	*500*	*18-Oct-2018 23:18*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.00116**		**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 17:25
Ethene	**0.00881**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 17:25
Methane	**0.0336**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 17:25
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**438**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:42
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.66**		**0.600**	**2.00**	**2.00**	**mg/L**	20	11-Oct-2018 03:51
Chloride	**513**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 03:51
Fluoride	**0.121**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 03:36
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 03:36
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 11:00
Sulfate	**2,130**		**8.00**	**20.0**	**20.0**	**mg/L**	40	11-Oct-2018 16:10
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW36-181009
Collection Date: 09-Oct-2018 14:53

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-07
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	25	U	15	25	50	ug/L	50	18-Oct-2018 23:42
1,1-Dichloroethene	**450**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 23:42
1,2-Dichloroethane	**34**	J	**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 23:42
cis-1,2-Dichloroethene	**66,000**		**100**	**250**	**500**	**ug/L**	500	19-Oct-2018 00:09
Methylene chloride	50	U	50	50	100	ug/L	50	18-Oct-2018 23:42
Trichloroethene	**22,000**		**100**	**250**	**500**	**ug/L**	500	19-Oct-2018 00:09
Vinyl chloride	**610**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 23:42
Surr: 1,2-Dichloroethane-d4	*93.9*			**0**	*70-126*	*%REC*	*50*	*18-Oct-2018 23:42*
Surr: 1,2-Dichloroethane-d4	*92.1*			**0**	*70-126*	*%REC*	*500*	*19-Oct-2018 00:09*
Surr: 4-Bromofluorobenzene	*97.4*			**0**	*81-113*	*%REC*	*50*	*18-Oct-2018 23:42*
Surr: 4-Bromofluorobenzene	*100*			**0**	*81-113*	*%REC*	*500*	*19-Oct-2018 00:09*
Surr: Dibromofluoromethane	*96.2*			**0**	*77-123*	*%REC*	*50*	*18-Oct-2018 23:42*
Surr: Dibromofluoromethane	*95.8*			**0**	*77-123*	*%REC*	*500*	*19-Oct-2018 00:09*
Surr: Toluene-d8	*91.7*			**0**	*82-127*	*%REC*	*50*	*18-Oct-2018 23:42*
Surr: Toluene-d8	*92.9*			**0**	*82-127*	*%REC*	*500*	*19-Oct-2018 00:09*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	0.00100	U	0.000144	0.00100	0.00100	mg/L	1	16-Oct-2018 17:40
Ethene	**0.0123**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 17:40
Methane	**0.175**		**0.000535**	**0.00250**	**0.00250**	**mg/L**	5	16-Oct-2018 17:55
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**613**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 22:49
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.70**		**0.600**	**2.00**	**2.00**	**mg/L**	20	11-Oct-2018 04:20
Chloride	**793**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 04:20
Fluoride	**0.251**		**0.100**	**0.200**	**0.200**	**mg/L**	2	11-Oct-2018 04:05
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 04:05
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 11:15
Sulfate	**6,290**		**40.0**	**100**	**100**	**mg/L**	200	11-Oct-2018 16:39
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW24-181009
Collection Date: 09-Oct-2018 14:45

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-08
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	16-Oct-2018 13:37
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:37
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:37
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:37
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	16-Oct-2018 13:37
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:37
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	16-Oct-2018 13:37
Surr: 1,2-Dichloroethane-d4	*91.0*			**0**	*70-126*	*%REC*	*1*	*16-Oct-2018 13:37*
Surr: 4-Bromofluorobenzene	*97.6*			**0**	*81-113*	*%REC*	*1*	*16-Oct-2018 13:37*
Surr: Dibromofluoromethane	*95.6*			**0**	*77-123*	*%REC*	*1*	*16-Oct-2018 13:37*
Surr: Toluene-d8	*91.6*			**0**	*82-127*	*%REC*	*1*	*16-Oct-2018 13:37*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000256**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 18:18
Ethene	**0.00139**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 18:18
Methane	**0.00165**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 18:18
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	5.00	U	5.00	5.00	5.00	mg/L	1	12-Oct-2018 22:52
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**1.26**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 04:34
Chloride	**287**		**2.00**	**5.00**	**5.00**	**mg/L**	10	11-Oct-2018 05:18
Fluoride	**0.326**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 11:29
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 04:34
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 11:29
Sulfate	**905**		**2.00**	**5.00**	**5.00**	**mg/L**	10	11-Oct-2018 05:18
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW24-181009-FD
Collection Date: 09-Oct-2018 14:45

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-09
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 17:18
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:18
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:18
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:18
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 17:18
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:18
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:18
Surr: 1,2-Dichloroethane-d4	*88.3*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 17:18*
Surr: 4-Bromofluorobenzene	*97.3*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 17:18*
Surr: Dibromofluoromethane	*95.9*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 17:18*
Surr: Toluene-d8	*92.0*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 17:18*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000555**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 19:18
Ethene	**0.00124**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 19:18
Methane	**0.00327**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 19:18
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	5.00	U	5.00	5.00	5.00	mg/L	1	12-Oct-2018 22:57
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**1.32**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 06:31
Chloride	**284**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 06:45
Fluoride	**0.330**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 06:31
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 06:31
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 13:01
Sulfate	**898**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 06:45
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16EW06-181009
Collection Date: 09-Oct-2018 14:55

ANALYTICAL REPORT
WorkOrder:HS18100492
Lab ID:HS18100492-10
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	2.5	U	1.5	2.5	5.0	ug/L	5	18-Oct-2018 21:05
1,1-Dichloroethene	**25**		**1.0**	**2.5**	**5.0**	**ug/L**	5	18-Oct-2018 21:05
1,2-Dichloroethane	**4.6**	J	**1.0**	**2.5**	**5.0**	**ug/L**	5	18-Oct-2018 21:05
cis-1,2-Dichloroethene	**3,700**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 21:32
Methylene chloride	5.0	U	5.0	5.0	10	ug/L	5	18-Oct-2018 21:05
Trichloroethene	**5,500**		**10**	**25**	**50**	**ug/L**	50	18-Oct-2018 21:32
Vinyl chloride	**240**		**1.0**	**2.5**	**5.0**	**ug/L**	5	18-Oct-2018 21:05
Surr: 1,2-Dichloroethane-d4	*91.6*			**0**	*70-126*	*%REC*	*5*	*18-Oct-2018 21:05*
Surr: 1,2-Dichloroethane-d4	*91.6*			**0**	*70-126*	*%REC*	*50*	*18-Oct-2018 21:32*
Surr: 4-Bromofluorobenzene	*98.2*			**0**	*81-113*	*%REC*	*5*	*18-Oct-2018 21:05*
Surr: 4-Bromofluorobenzene	*97.1*			**0**	*81-113*	*%REC*	*50*	*18-Oct-2018 21:32*
Surr: Dibromofluoromethane	*93.8*			**0**	*77-123*	*%REC*	*5*	*18-Oct-2018 21:05*
Surr: Dibromofluoromethane	*95.6*			**0**	*77-123*	*%REC*	*50*	*18-Oct-2018 21:32*
Surr: Toluene-d8	*91.3*			**0**	*82-127*	*%REC*	*5*	*18-Oct-2018 21:05*
Surr: Toluene-d8	*92.5*			**0**	*82-127*	*%REC*	*50*	*18-Oct-2018 21:32*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000310**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 19:28
Ethene	**0.00376**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	16-Oct-2018 19:28
Methane	**0.00839**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	16-Oct-2018 19:28
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**438**		**5.00**	**5.00**	**5.00**	**mg/L**	1	12-Oct-2018 23:04
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.38**		**0.600**	**2.00**	**2.00**	**mg/L**	20	11-Oct-2018 07:14
Chloride	**683**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 07:14
Fluoride	**0.208**		**0.100**	**0.200**	**0.200**	**mg/L**	2	11-Oct-2018 07:00
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 07:00
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 13:40
Sulfate	**6,120**		**40.0**	**100**	**100**	**mg/L**	200	11-Oct-2018 16:53
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	23-Oct-2018 09:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325252 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** Water	
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			11 Oct 2018 01:11	1
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			11 Oct 2018 01:54	20
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			11 Oct 2018 01:40	1
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			11 Oct 2018 14:53	200
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			11 Oct 2018 02:23	20
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			11 Oct 2018 02:09	2
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			11 Oct 2018 15:07	200
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			11 Oct 2018 10:46	2
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			11 Oct 2018 03:22	20
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			11 Oct 2018 03:07	1
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			11 Oct 2018 11:00	2
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			11 Oct 2018 16:10	40
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			11 Oct 2018 03:51	20
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			11 Oct 2018 03:36	1
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			11 Oct 2018 16:39	200
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			11 Oct 2018 11:15	2
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			11 Oct 2018 04:20	20
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			11 Oct 2018 04:05	2
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			11 Oct 2018 11:29	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			11 Oct 2018 05:18	10
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			11 Oct 2018 04:34	1
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			11 Oct 2018 13:01	2
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			11 Oct 2018 06:45	20
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			11 Oct 2018 06:31	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			11 Oct 2018 13:40	2
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			11 Oct 2018 16:53	200
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			11 Oct 2018 07:14	20
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			11 Oct 2018 07:00	2
Batch ID: R325372 (0)	**Test Name :** ALKALINITY BY SM2320B				**Matrix:** Water	
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			12 Oct 2018 22:00	1
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			12 Oct 2018 22:05	1
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			12 Oct 2018 22:13	1
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			12 Oct 2018 22:19	1
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			12 Oct 2018 22:42	1
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			12 Oct 2018 22:49	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			12 Oct 2018 22:52	1
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			12 Oct 2018 22:57	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			12 Oct 2018 23:04	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325554 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Water	
HS18100492-01	16TB01-181009	09 Oct 2018 00:00			16 Oct 2018 13:13	1
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			16 Oct 2018 20:08	1
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			16 Oct 2018 20:33	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			16 Oct 2018 13:37	1
Batch ID: R325683 (0)	**Test Name :** DISSOLVED GASES BY RSK-175				**Matrix:** Water	
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			16 Oct 2018 12:58	5
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			16 Oct 2018 12:35	1
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			16 Oct 2018 15:57	1
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			16 Oct 2018 16:09	1
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			16 Oct 2018 16:58	1
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			16 Oct 2018 17:25	1
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			16 Oct 2018 17:55	5
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			16 Oct 2018 17:40	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			16 Oct 2018 18:18	1
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			16 Oct 2018 19:18	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			16 Oct 2018 19:28	1
Batch ID: R325746 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Water	
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			18 Oct 2018 20:38	25
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			18 Oct 2018 20:11	5
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			18 Oct 2018 22:26	100
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			18 Oct 2018 21:59	10
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			18 Oct 2018 23:18	500
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			18 Oct 2018 22:51	50
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			19 Oct 2018 00:09	500
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			18 Oct 2018 23:42	50
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			18 Oct 2018 17:18	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			18 Oct 2018 21:32	50
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			18 Oct 2018 21:05	5
Batch ID: R325853 (0)	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Water	
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			22 Oct 2018 09:40	1
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			22 Oct 2018 09:40	1
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			22 Oct 2018 09:40	1
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			22 Oct 2018 09:40	1
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			22 Oct 2018 09:40	1
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			22 Oct 2018 09:40	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			22 Oct 2018 09:40	1
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			22 Oct 2018 09:40	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			22 Oct 2018 09:40	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325934 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Water	
HS18100492-02	16WW43-181009	09 Oct 2018 09:49			23 Oct 2018 09:23	1
HS18100492-03	16WW26-181009	09 Oct 2018 11:18			23 Oct 2018 09:23	1
HS18100492-04	16WW41-181009	09 Oct 2018 11:25			23 Oct 2018 09:23	1
HS18100492-05	16WW25-181009	09 Oct 2018 13:12			23 Oct 2018 09:23	1
HS18100492-06	16EW02-181009	09 Oct 2018 13:40			23 Oct 2018 09:23	1
HS18100492-07	16WW36-181009	09 Oct 2018 14:53			23 Oct 2018 09:23	1
HS18100492-08	16WW24-181009	09 Oct 2018 14:45			23 Oct 2018 09:23	1
HS18100492-09	16WW24-181009-FD	09 Oct 2018 14:45			23 Oct 2018 09:23	1
HS18100492-10	16EW06-181009	09 Oct 2018 14:55			23 Oct 2018 09:23	1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325683 (0) **Instrument:** FID-4 **Method:** DISSOLVED GASES BY RSK-175

MBLK Sample ID: **MBLK-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 12:09**
Client ID: Run ID: **FID-4_325683** SeqNo: **4778290** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.00100	0.00100								U
Ethene	0.00100	0.00100								U
Methane	0.000500	0.000500								U

LCS Sample ID: **LCS-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 10:48**
Client ID: Run ID: **FID-4_325683** SeqNo: **4778288** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0180	0.00100	0.01804	0	99.8	75 - 125				
Ethene	0.0167	0.00100	0.0168	0	99.5	75 - 125				
Methane	0.00815	0.000500	0.009647	0	84.5	75 - 125				

LCSD Sample ID: **LCSD-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 11:28**
Client ID: Run ID: **FID-4_325683** SeqNo: **4778289** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0174	0.00100	0.01804	0	96.5	75 - 125	0.01801	3.37	30	
Ethene	0.0161	0.00100	0.0168	0	95.6	75 - 125	0.01672	4.05	30	
Methane	0.00910	0.000500	0.009647	0	94.4	75 - 125	0.008152	11	30	

MS Sample ID: **HS18100492-08MS** Units: **mg/L** Analysis Date: **16-Oct-2018 18:28**
Client ID: **16WW24-181009** Run ID: **FID-4_325683** SeqNo: **4778301** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0240	0.00100	0.01804	0.0002557	131	75 - 125				S
Ethene	0.0279	0.00100	0.0168	0.001386	158	75 - 125				S
Methane	0.0119	0.000500	0.009647	0.001652	106	75 - 125				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325683 (0) **Instrument:** FID-4 **Method:** DISSOLVED GASES BY RSK-175

MSD Sample ID: **HS18100492-08MSD** Units: **mg/L** Analysis Date: **16-Oct-2018 18:53**
Client ID: **16WW24-181009** Run ID: **FID-4_325683** SeqNo: **4778302** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0238	0.00100	0.01804	0.0002557	130	75 - 125	0.02398	0.78	30	S
Ethene	0.0267	0.00100	0.0168	0.001386	151	75 - 125	0.02790	4.24	30	S
Methane	0.0112	0.000500	0.009647	0.001652	98.9	75 - 125	0.01192	6.3	30	

The following samples were analyzed in this batch: HS18100492-02 HS18100492-03 HS18100492-04 HS18100492-05 HS18100492-06 HS18100492-07 HS18100492-08 HS18100492-09 HS18100492-10

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 12:00**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775026** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 12:00**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775026** 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	*45.54*	*1.0*	*50*	*0*	*91.1*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.61*	*1.0*	*50*	*0*	*97.2*	*82 - 115*				
Surr: Dibromofluoromethane	*48.76*	*1.0*	*50*	*0*	*97.5*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325554 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 12:00**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775026** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.7*	*1.0*	*50*	*0*	*93.4*	*81 - 120*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 11:11**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775048** 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	20.58	1.0	20	0	103	77 - 118				
1,1,1-Trichloroethane	18.55	1.0	20	0	92.8	70 - 130				
1,1,2,2-Tetrachloroethane	17.73	1.0	20	0	88.7	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.68	1.0	20	0	103	70 - 130				
1,1,2-Trichloroethane	20.26	1.0	20	0	101	77 - 113				
1,1-Dichloroethane	19.29	1.0	20	0	96.5	71 - 122				
1,1-Dichloroethene	19.69	1.0	20	0	98.4	70 - 130				
1,1-Dichloropropene	21.74	1.0	20	0	109	78 - 118				
1,2,3-Trichlorobenzene	18.49	1.0	20	0	92.5	70 - 130				
1,2,3-Trichloropropane	17.73	1.0	20	0	88.7	70 - 127				
1,2,4-Trichlorobenzene	18.8	1.0	20	0	94.0	77 - 126				
1,2,4-Trimethylbenzene	20.98	1.0	20	0	105	73 - 121				
1,2-Dibromo-3-chloropropane	16.3	1.0	20	0	81.5	70 - 130				
1,2-Dibromoethane	20.71	1.0	20	0	104	76 - 123				
1,2-Dichlorobenzene	19.49	1.0	20	0	97.4	77 - 113				
1,2-Dichloroethane	19.79	1.0	20	0	98.9	70 - 124				
1,2-Dichloropropane	21.02	1.0	20	0	105	72 - 119				
1,3,5-Trimethylbenzene	19.32	1.0	20	0	96.6	75 - 118				
1,3-Dichlorobenzene	19.9	1.0	20	0	99.5	78 - 118				
1,3-Dichloropropane	20.54	1.0	20	0	103	75 - 116				
1,4-Dichlorobenzene	19.87	1.0	20	0	99.4	79 - 113				
2,2-Dichloropropane	21.5	1.0	20	0	108	70 - 130				
2-Butanone	35.56	2.0	40	0	88.9	70 - 130				
2-Chlorotoluene	21.45	1.0	20	0	107	70 - 128				
2-Hexanone	36.32	2.0	40	0	90.8	70 - 130				
4-Chlorotoluene	21.51	1.0	20	0	108	74 - 126				
4-Isopropyltoluene	18.61	1.0	20	0	93.0	74 - 126				
4-Methyl-2-pentanone	36.57	2.0	40	0	91.4	70 - 130				
Acetone	35.34	2.0	40	0	88.4	70 - 130				
Benzene	20.57	1.0	20	0	103	74 - 120				
Bromobenzene	19.89	1.0	20	0	99.5	78 - 113				
Bromochloromethane	20.37	1.0	20	0	102	76 - 124				
Bromodichloromethane	20.7	1.0	20	0	103	74 - 122				
Bromoform	19.36	1.0	20	0	96.8	73 - 128				

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 11:11**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775048** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.4	1.0	20	0	122	70 - 130				
Carbon disulfide	37.98	2.0	40	0	94.9	70 - 130				
Carbon tetrachloride	21.53	1.0	20	0	108	71 - 125				
Chlorobenzene	20.91	1.0	20	0	105	76 - 113				
Chloroethane	18.96	1.0	20	0	94.8	70 - 130				
Chloroform	19.14	1.0	20	0	95.7	71 - 121				
Chloromethane	17.29	1.0	20	0	86.5	70 - 129				
cis-1,2-Dichloroethene	19.8	1.0	20	0	99.0	75 - 122				
cis-1,3-Dichloropropene	22.1	1.0	20	0	111	73 - 127				
Dibromochloromethane	20.07	1.0	20	0	100	77 - 122				
Dibromomethane	20.75	1.0	20	0	104	78 - 121				
Dichlorodifluoromethane	14.26	1.0	20	0	71.3	70 - 130				
Ethylbenzene	22.74	1.0	20	0	114	77 - 117				
Hexachlorobutadiene	20	1.0	20	0	100.0	70 - 130				
Isopropylbenzene	20.12	1.0	20	0	101	73 - 127				
m,p-Xylene	44.51	2.0	40	0	111	77 - 122				
Methylene chloride	19.92	2.0	20	0	99.6	70 - 127				
Naphthalene	16.85	1.0	20	0	84.2	70 - 130				
n-Butylbenzene	20.68	1.0	20	0	103	72 - 130				
n-Propylbenzene	21.77	1.0	20	0	109	73 - 124				
o-Xylene	22.42	1.0	20	0	112	75 - 119				
sec-Butylbenzene	19.01	1.0	20	0	95.0	73 - 128				
Styrene	20.91	1.0	20	0	105	72 - 126				
tert-Butylbenzene	21.32	1.0	20	0	107	73 - 124				
Tetrachloroethene	20.34	1.0	20	0	102	76 - 119				
Toluene	20.29	1.0	20	0	101	77 - 118				
trans-1,2-Dichloroethene	20.13	1.0	20	0	101	72 - 127				
trans-1,3-Dichloropropene	22.29	1.0	20	0	111	77 - 119				
Trichloroethene	20.09	1.0	20	0	100	77 - 121				
Trichlorofluoromethane	19.06	1.0	20	0	95.3	70 - 130				
Vinyl chloride	19.02	1.0	20	0	95.1	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.55*	*1.0*	*50*	*0*	*93.1*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.46*	*1.0*	*50*	*0*	*101*	*82 - 115*				
Surr: Dibromofluoromethane	*46.48*	*1.0*	*50*	*0*	*93.0*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325554 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181016** Units: **ug/L** Analysis Date: **16-Oct-2018 11:11**
Client ID: Run ID: **VOA2_325554** SeqNo: **4775048** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.1*	*1.0*	*50*	*0*	*90.2*	*81 - 120*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100492-08MS** Units: **ug/L** Analysis Date: **16-Oct-2018 14:51**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775138** 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	19.72	1.0	20	0	98.6	70 - 120				
1,1,1-Trichloroethane	18.92	1.0	20	0	94.6	70 - 130				
1,1,2,2-Tetrachloroethane	15.75	1.0	20	0	78.8	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.97	1.0	20	0	105	70 - 130				
1,1,2-Trichloroethane	19.44	1.0	20	0	97.2	70 - 117				
1,1-Dichloroethane	19.22	1.0	20	0	96.1	70 - 127				
1,1-Dichloroethene	19.8	1.0	20	0	99.0	70 - 130				
1,1-Dichloropropene	21.64	1.0	20	0	108	70 - 129				
1,2,3-Trichlorobenzene	16.42	1.0	20	0	82.1	70 - 130				
1,2,3-Trichloropropane	15.58	1.0	20	0	77.9	70 - 130				
1,2,4-Trichlorobenzene	17.58	1.0	20	0	87.9	70 - 125				
1,2,4-Trimethylbenzene	20.18	1.0	20	0	101	70 - 125				
1,2-Dibromo-3-chloropropane	15.21	1.0	20	0	76.0	70 - 130				
1,2-Dibromoethane	19.47	1.0	20	0	97.4	70 - 124				
1,2-Dichlorobenzene	17.85	1.0	20	0	89.3	70 - 115				
1,2-Dichloroethane	19.72	1.0	20	0	98.6	70 - 127				
1,2-Dichloropropane	20.78	1.0	20	0	104	70 - 122				
1,3,5-Trimethylbenzene	18.27	1.0	20	0	91.4	70 - 126				
1,3-Dichlorobenzene	18.33	1.0	20	0	91.6	70 - 119				
1,3-Dichloropropane	19.35	1.0	20	0	96.8	70 - 121				
1,4-Dichlorobenzene	18.27	1.0	20	0	91.4	70 - 114				
2,2-Dichloropropane	21.75	1.0	20	0	109	70 - 130				
2-Butanone	33.88	2.0	40	0	84.7	70 - 130				
2-Chlorotoluene	19.06	1.0	20	0	95.3	70 - 130				
2-Hexanone	35.2	2.0	40	0	88.0	70 - 130				
4-Chlorotoluene	19.55	1.0	20	0	97.8	70 - 130				
4-Isopropyltoluene	17.9	1.0	20	0	89.5	70 - 130				
4-Methyl-2-pentanone	36.51	2.0	40	0	91.3	70 - 130				
Acetone	29.52	2.0	40	0	73.8	70 - 130				
Benzene	20.31	1.0	20	0	102	70 - 127				
Bromobenzene	18.1	1.0	20	0	90.5	70 - 115				
Bromochloromethane	19.61	1.0	20	0	98.1	70 - 127				
Bromodichloromethane	19.93	1.0	20	0	99.6	70 - 124				
Bromoform	17.96	1.0	20	0	89.8	70 - 129				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100492-08MS** Units: **ug/L** Analysis Date: **16-Oct-2018 14:51**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775138** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.7	1.0	20	0	113	70 - 130				
Carbon disulfide	39.24	2.0	40	0	98.1	70 - 130				
Carbon tetrachloride	20.62	1.0	20	0	103	70 - 130				
Chlorobenzene	20.63	1.0	20	0	103	70 - 114				
Chloroethane	18.62	1.0	20	0	93.1	70 - 130				
Chloroform	18.79	1.0	20	0	93.9	70 - 125				
Chloromethane	16	1.0	20	0	80.0	70 - 130				
cis-1,2-Dichloroethene	19.94	1.0	20	0	99.7	70 - 128				
cis-1,3-Dichloropropene	21.18	1.0	20	0	106	70 - 125				
Dibromochloromethane	18.77	1.0	20	0	93.8	70 - 124				
Dibromomethane	20.79	1.0	20	0	104	70 - 124				
Dichlorodifluoromethane	13.27	1.0	20	0	66.4	70 - 130				S
Ethylbenzene	22.39	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	18.17	1.0	20	0	90.9	70 - 130				
Isopropylbenzene	20.18	1.0	20	0	101	70 - 130				
m,p-Xylene	44.95	2.0	40	0	112	70 - 130				
Methylene chloride	18.94	2.0	20	0	94.7	70 - 128				
Naphthalene	17.58	1.0	20	0	87.9	70 - 130				
n-Butylbenzene	19.94	1.0	20	0	99.7	70 - 130				
n-Propylbenzene	20.65	1.0	20	0	103	70 - 130				
o-Xylene	22.29	1.0	20	0	111	70 - 124				
sec-Butylbenzene	18.26	1.0	20	0	91.3	70 - 130				
Styrene	20.53	1.0	20	0	103	70 - 130				
tert-Butylbenzene	19.67	1.0	20	0	98.4	70 - 130				
Tetrachloroethene	20.67	1.0	20	0	103	70 - 130				
Toluene	20.28	1.0	20	0	101	70 - 123				
trans-1,2-Dichloroethene	20.6	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	20.87	1.0	20	0	104	70 - 121				
Trichloroethene	20.4	1.0	20	0	102	70 - 129				
Trichlorofluoromethane	20.15	1.0	20	0	101	70 - 130				
Vinyl chloride	19.5	1.0	20	0	97.5	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.21*	*1.0*	*50*	*0*	*94.4*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.61*	*1.0*	*50*	*0*	*103*	*81 - 113*				
Surr: Dibromofluoromethane	*48.17*	*1.0*	*50*	*0*	*96.3*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325554 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100492-08MS** Units: **ug/L** Analysis Date: **16-Oct-2018 14:51**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775138** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.42*	*1.0*	*50*	*0*	*90.8*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100492-08MSD** Units: **ug/L** Analysis Date: **16-Oct-2018 15:15**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775139** 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	19.04	1.0	20	0	95.2	70 - 120	19.72	3.51	20	
1,1,1-Trichloroethane	17.71	1.0	20	0	88.5	70 - 130	18.92	6.6	20	
1,1,2,2-Tetrachloroethane	15.5	1.0	20	0	77.5	70 - 123	15.75	1.57	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	19.32	1.0	20	0	96.6	70 - 130	20.97	8.21	20	
1,1,2-Trichloroethane	18.63	1.0	20	0	93.1	70 - 117	19.44	4.29	20	
1,1-Dichloroethane	18.45	1.0	20	0	92.3	70 - 127	19.22	4.05	20	
1,1-Dichloroethene	18.48	1.0	20	0	92.4	70 - 130	19.8	6.89	20	
1,1-Dichloropropene	19.76	1.0	20	0	98.8	70 - 129	21.64	9.04	20	
1,2,3-Trichlorobenzene	16.67	1.0	20	0	83.3	70 - 130	16.42	1.48	20	
1,2,3-Trichloropropane	15.51	1.0	20	0	77.6	70 - 130	15.58	0.434	20	
1,2,4-Trichlorobenzene	18.36	1.0	20	0	91.8	70 - 125	17.58	4.37	20	
1,2,4-Trimethylbenzene	19.71	1.0	20	0	98.6	70 - 125	20.18	2.33	20	
1,2-Dibromo-3-chloropropane	13.75	1.0	20	0	68.8	70 - 130	15.21	10	20	S
1,2-Dibromoethane	18.86	1.0	20	0	94.3	70 - 124	19.47	3.21	20	
1,2-Dichlorobenzene	18.08	1.0	20	0	90.4	70 - 115	17.85	1.26	20	
1,2-Dichloroethane	18.76	1.0	20	0	93.8	70 - 127	19.72	5	20	
1,2-Dichloropropane	19.99	1.0	20	0	99.9	70 - 122	20.78	3.88	20	
1,3,5-Trimethylbenzene	17.75	1.0	20	0	88.7	70 - 126	18.27	2.91	20	
1,3-Dichlorobenzene	18.31	1.0	20	0	91.5	70 - 119	18.33	0.115	20	
1,3-Dichloropropane	18.66	1.0	20	0	93.3	70 - 121	19.35	3.63	20	
1,4-Dichlorobenzene	18.45	1.0	20	0	92.2	70 - 114	18.27	0.957	20	
2,2-Dichloropropane	20.56	1.0	20	0	103	70 - 130	21.75	5.61	20	
2-Butanone	32.12	2.0	40	0	80.3	70 - 130	33.88	5.35	20	
2-Chlorotoluene	19.76	1.0	20	0	98.8	70 - 130	19.06	3.56	20	
2-Hexanone	32.82	2.0	40	0	82.1	70 - 130	35.2	6.98	20	
4-Chlorotoluene	19.65	1.0	20	0	98.2	70 - 130	19.55	0.494	20	
4-Isopropyltoluene	17.33	1.0	20	0	86.6	70 - 130	17.9	3.23	20	
4-Methyl-2-pentanone	33.84	2.0	40	0	84.6	70 - 130	36.51	7.6	20	
Acetone	32.47	2.0	40	0	81.2	70 - 130	29.52	9.52	20	
Benzene	19.46	1.0	20	0	97.3	70 - 127	20.31	4.25	20	
Bromobenzene	18.12	1.0	20	0	90.6	70 - 115	18.1	0.0776	20	
Bromochloromethane	19.55	1.0	20	0	97.8	70 - 127	19.61	0.307	20	
Bromodichloromethane	19.56	1.0	20	0	97.8	70 - 124	19.93	1.87	20	
Bromoform	17.46	1.0	20	0	87.3	70 - 129	17.96	2.81	20	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325554 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100492-08MSD** Units: **ug/L** Analysis Date: **16-Oct-2018 15:15**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775139** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.15	1.0	20	0	111	70 - 130	22.7	2.43	20	
Carbon disulfide	35.74	2.0	40	0	89.4	70 - 130	39.24	9.31	20	
Carbon tetrachloride	19.45	1.0	20	0	97.2	70 - 130	20.62	5.87	20	
Chlorobenzene	19.85	1.0	20	0	99.3	70 - 114	20.63	3.83	20	
Chloroethane	17.24	1.0	20	0	86.2	70 - 130	18.62	7.69	20	
Chloroform	18.45	1.0	20	0	92.3	70 - 125	18.79	1.79	20	
Chloromethane	15.17	1.0	20	0	75.9	70 - 130	16	5.34	20	
cis-1,2-Dichloroethene	19.37	1.0	20	0	96.8	70 - 128	19.94	2.92	20	
cis-1,3-Dichloropropene	20.68	1.0	20	0	103	70 - 125	21.18	2.38	20	
Dibromochloromethane	18.6	1.0	20	0	93.0	70 - 124	18.77	0.878	20	
Dibromomethane	19.29	1.0	20	0	96.4	70 - 124	20.79	7.5	20	
Dichlorodifluoromethane	12.09	1.0	20	0	60.5	70 - 130	13.27	9.29	20	S
Ethylbenzene	21.52	1.0	20	0	108	70 - 124	22.39	3.97	20	
Hexachlorobutadiene	18.06	1.0	20	0	90.3	70 - 130	18.17	0.611	20	
Isopropylbenzene	18.98	1.0	20	0	94.9	70 - 130	20.18	6.17	20	
m,p-Xylene	42.25	2.0	40	0	106	70 - 130	44.95	6.18	20	
Methylene chloride	19.14	2.0	20	0	95.7	70 - 128	18.94	1.05	20	
Naphthalene	16.23	1.0	20	0	81.1	70 - 130	17.58	7.99	20	
n-Butylbenzene	19	1.0	20	0	95.0	70 - 130	19.94	4.86	20	
n-Propylbenzene	19.9	1.0	20	0	99.5	70 - 130	20.65	3.75	20	
o-Xylene	20.86	1.0	20	0	104	70 - 124	22.29	6.6	20	
sec-Butylbenzene	17.69	1.0	20	0	88.4	70 - 130	18.26	3.16	20	
Styrene	20.16	1.0	20	0	101	70 - 130	20.53	1.82	20	
tert-Butylbenzene	19.22	1.0	20	0	96.1	70 - 130	19.67	2.33	20	
Tetrachloroethene	18.91	1.0	20	0	94.6	70 - 130	20.67	8.86	20	
Toluene	19.01	1.0	20	0	95.1	70 - 123	20.28	6.44	20	
trans-1,2-Dichloroethene	19.08	1.0	20	0	95.4	70 - 130	20.6	7.68	20	
trans-1,3-Dichloropropene	20.51	1.0	20	0	103	70 - 121	20.87	1.76	20	
Trichloroethene	19.41	1.0	20	0	97.1	70 - 129	20.4	4.94	20	
Trichlorofluoromethane	18.31	1.0	20	0	91.6	70 - 130	20.15	9.54	20	
Vinyl chloride	17.78	1.0	20	0	88.9	70 - 130	19.5	9.25	20	
Surr: 1,2-Dichloroethane-d4	*46.43*	*1.0*	*50*	*0*	*92.9*	*70 - 126*	*47.21*	*1.66*	*20*	
Surr: 4-Bromofluorobenzene	*51.22*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.61*	*0.766*	*20*	
Surr: Dibromofluoromethane	*47.38*	*1.0*	*50*	*0*	*94.8*	*77 - 123*	*48.17*	*1.66*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325554 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100492-08MSD** Units: **ug/L** Analysis Date: **16-Oct-2018 15:15**
Client ID: **16WW24-181009** Run ID: **VOA2_325554** SeqNo: **4775139** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.16*	*1.0*	*50*	*0*	*90.3*	*82 - 127*	*45.42*	*0.585*	*20*	

The following samples were analyzed in this batch: HS18100492-01 HS18100492-02 HS18100492-05 HS18100492-08

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** 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	*43.36*	*1.0*	*50*	*0*	*86.7*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.8*	*1.0*	*50*	*0*	*97.6*	*82 - 115*				
Surr: Dibromofluoromethane	*48.22*	*1.0*	*50*	*0*	*96.4*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.49*	*1.0*	*50*	*0*	*93.0*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** 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	20.53	1.0	20	0	103	77 - 118				
1,1,1-Trichloroethane	18.86	1.0	20	0	94.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.63	1.0	20	0	83.2	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.18	1.0	20	0	106	70 - 130				
1,1,2-Trichloroethane	19.93	1.0	20	0	99.7	77 - 113				
1,1-Dichloroethane	19.8	1.0	20	0	99.0	71 - 122				
1,1-Dichloroethene	19.33	1.0	20	0	96.6	70 - 130				
1,1-Dichloropropene	21.51	1.0	20	0	108	78 - 118				
1,2,3-Trichlorobenzene	17.37	1.0	20	0	86.8	70 - 130				
1,2,3-Trichloropropane	16.89	1.0	20	0	84.5	70 - 127				
1,2,4-Trichlorobenzene	18.68	1.0	20	0	93.4	77 - 126				
1,2,4-Trimethylbenzene	21.51	1.0	20	0	108	73 - 121				
1,2-Dibromo-3-chloropropane	14.83	1.0	20	0	74.1	70 - 130				
1,2-Dibromoethane	20.01	1.0	20	0	100	76 - 123				
1,2-Dichlorobenzene	19.65	1.0	20	0	98.2	77 - 113				
1,2-Dichloroethane	19.51	1.0	20	0	97.5	70 - 124				
1,2-Dichloropropane	21.49	1.0	20	0	107	72 - 119				
1,3,5-Trimethylbenzene	19.75	1.0	20	0	98.7	75 - 118				
1,3-Dichlorobenzene	19.83	1.0	20	0	99.1	78 - 118				
1,3-Dichloropropane	20	1.0	20	0	100.0	75 - 116				
1,4-Dichlorobenzene	20.55	1.0	20	0	103	79 - 113				
2,2-Dichloropropane	22.17	1.0	20	0	111	70 - 130				
2-Butanone	32.82	2.0	40	0	82.0	70 - 130				
2-Chlorotoluene	21.38	1.0	20	0	107	70 - 128				
2-Hexanone	33.25	2.0	40	0	83.1	70 - 130				
4-Chlorotoluene	21.73	1.0	20	0	109	74 - 126				
4-Isopropyltoluene	19	1.0	20	0	95.0	74 - 126				
4-Methyl-2-pentanone	34.53	2.0	40	0	86.3	70 - 130				
Acetone	32.89	2.0	40	0	82.2	70 - 130				
Benzene	20.78	1.0	20	0	104	74 - 120				
Bromobenzene	19.94	1.0	20	0	99.7	78 - 113				
Bromochloromethane	20.73	1.0	20	0	104	76 - 124				
Bromodichloromethane	20.89	1.0	20	0	104	74 - 122				
Bromoform	19.09	1.0	20	0	95.5	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	25.23	1.0	20	0	126	70 - 130				
Carbon disulfide	38.37	2.0	40	0	95.9	70 - 130				
Carbon tetrachloride	21.25	1.0	20	0	106	71 - 125				
Chlorobenzene	20.82	1.0	20	0	104	76 - 113				
Chloroethane	20.03	1.0	20	0	100	70 - 130				
Chloroform	19.22	1.0	20	0	96.1	71 - 121				
Chloromethane	18.25	1.0	20	0	91.2	70 - 129				
cis-1,2-Dichloroethene	20.34	1.0	20	0	102	75 - 122				
cis-1,3-Dichloropropene	22.11	1.0	20	0	111	73 - 127				
Dibromochloromethane	19.77	1.0	20	0	98.9	77 - 122				
Dibromomethane	20.5	1.0	20	0	102	78 - 121				
Dichlorodifluoromethane	14.82	1.0	20	0	74.1	70 - 130				
Ethylbenzene	22.7	1.0	20	0	114	77 - 117				
Hexachlorobutadiene	20.48	1.0	20	0	102	70 - 130				
Isopropylbenzene	20.48	1.0	20	0	102	73 - 127				
m,p-Xylene	46.4	2.0	40	0	116	77 - 122				
Methylene chloride	20.02	2.0	20	0	100	70 - 127				
Naphthalene	15.31	1.0	20	0	76.5	70 - 130				
n-Butylbenzene	20.82	1.0	20	0	104	72 - 130				
n-Propylbenzene	22.11	1.0	20	0	111	73 - 124				
o-Xylene	22.33	1.0	20	0	112	75 - 119				
sec-Butylbenzene	19.32	1.0	20	0	96.6	73 - 128				
Styrene	21.17	1.0	20	0	106	72 - 126				
tert-Butylbenzene	21.25	1.0	20	0	106	73 - 124				
Tetrachloroethene	20.36	1.0	20	0	102	76 - 119				
Toluene	20.46	1.0	20	0	102	77 - 118				
trans-1,2-Dichloroethene	20.52	1.0	20	0	103	72 - 127				
trans-1,3-Dichloropropene	22.37	1.0	20	0	112	77 - 119				
Trichloroethene	21.27	1.0	20	0	106	77 - 121				
Trichlorofluoromethane	20.65	1.0	20	0	103	70 - 130				
Vinyl chloride	19.94	1.0	20	0	99.7	70 - 130				
Surr: 1,2-Dichloroethane-d4	*45.03*	*1.0*	*50*	*0*	*90.1*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.78*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.4*	*1.0*	*50*	*0*	*94.8*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.21*	*1.0*	*50*	*0*	*90.4*	*81 - 120*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779651** 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	19.9	1.0	20	0	99.5	70 - 120				
1,1,1-Trichloroethane	19.85	1.0	20	0	99.2	70 - 130				
1,1,2,2-Tetrachloroethane	16.75	1.0	20	0	83.8	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	23.06	1.0	20	0	115	70 - 130				
1,1,2-Trichloroethane	19.23	1.0	20	0	96.2	70 - 117				
1,1-Dichloroethane	20.23	1.0	20	0	101	70 - 127				
1,1-Dichloroethene	21.12	1.0	20	0	106	70 - 130				
1,1-Dichloropropene	22.98	1.0	20	0	115	70 - 129				
1,2,3-Trichlorobenzene	16.79	1.0	20	0	84.0	70 - 130				
1,2,3-Trichloropropane	17.04	1.0	20	0	85.2	70 - 130				
1,2,4-Trichlorobenzene	18.35	1.0	20	0	91.7	70 - 125				
1,2,4-Trimethylbenzene	20.2	1.0	20	0	101	70 - 125				
1,2-Dibromo-3-chloropropane	15.11	1.0	20	0	75.5	70 - 130				
1,2-Dibromoethane	20.23	1.0	20	0	101	70 - 124				
1,2-Dichlorobenzene	18.84	1.0	20	0	94.2	70 - 115				
1,2-Dichloroethane	19.51	1.0	20	0	97.5	70 - 127				
1,2-Dichloropropane	20.81	1.0	20	0	104	70 - 122				
1,3,5-Trimethylbenzene	18.84	1.0	20	0	94.2	70 - 126				
1,3-Dichlorobenzene	19.38	1.0	20	0	96.9	70 - 119				
1,3-Dichloropropane	19.78	1.0	20	0	98.9	70 - 121				
1,4-Dichlorobenzene	20.14	1.0	20	0	101	70 - 114				
2,2-Dichloropropane	24.13	1.0	20	0	121	70 - 130				
2-Butanone	36.01	2.0	40	0	90.0	70 - 130				
2-Chlorotoluene	20.76	1.0	20	0	104	70 - 130				
2-Hexanone	35.65	2.0	40	0	89.1	70 - 130				
4-Chlorotoluene	21.04	1.0	20	0	105	70 - 130				
4-Isopropyltoluene	18.65	1.0	20	0	93.3	70 - 130				
4-Methyl-2-pentanone	35.73	2.0	40	0	89.3	70 - 130				
Acetone	33.5	2.0	40	0	83.8	70 - 130				
Benzene	20.4	1.0	20	0	102	70 - 127				
Bromobenzene	19.03	1.0	20	0	95.1	70 - 115				
Bromochloromethane	20.07	1.0	20	0	100	70 - 127				
Bromodichloromethane	20.4	1.0	20	0	102	70 - 124				
Bromoform	18.89	1.0	20	0	94.5	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779651** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.14	1.0	20	0	121	70 - 130				
Carbon disulfide	40.53	2.0	40	0	101	70 - 130				
Carbon tetrachloride	21.38	1.0	20	0	107	70 - 130				
Chlorobenzene	20.81	1.0	20	0	104	70 - 114				
Chloroethane	20.23	1.0	20	0	101	70 - 130				
Chloroform	19.57	1.0	20	0	97.8	70 - 125				
Chloromethane	17.45	1.0	20	0	87.2	70 - 130				
cis-1,2-Dichloroethene	20.83	1.0	20	0	104	70 - 128				
cis-1,3-Dichloropropene	22.19	1.0	20	0	111	70 - 125				
Dibromochloromethane	19.34	1.0	20	0	96.7	70 - 124				
Dibromomethane	19.74	1.0	20	0	98.7	70 - 124				
Dichlorodifluoromethane	15.84	1.0	20	0	79.2	70 - 130				
Ethylbenzene	22.34	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	19.43	1.0	20	0	97.2	70 - 130				
Isopropylbenzene	20.2	1.0	20	0	101	70 - 130				
m,p-Xylene	45.94	2.0	40	0	115	70 - 130				
Methylene chloride	19.93	2.0	20	0	99.7	70 - 128				
Naphthalene	15.61	1.0	20	0	78.1	70 - 130				
n-Butylbenzene	20.82	1.0	20	0	104	70 - 130				
n-Propylbenzene	21.93	1.0	20	0	110	70 - 130				
o-Xylene	22.17	1.0	20	0	111	70 - 124				
sec-Butylbenzene	18.87	1.0	20	0	94.4	70 - 130				
Styrene	20.53	1.0	20	0	103	70 - 130				
tert-Butylbenzene	20.84	1.0	20	0	104	70 - 130				
Tetrachloroethene	20.61	1.0	20	0	103	70 - 130				
Toluene	20.26	1.0	20	0	101	70 - 123				
trans-1,2-Dichloroethene	21.62	1.0	20	0	108	70 - 130				
trans-1,3-Dichloropropene	22.47	1.0	20	0	112	70 - 121				
Trichloroethene	21.67	1.0	20	0	108	70 - 129				
Trichlorofluoromethane	21.58	1.0	20	0	108	70 - 130				
Vinyl chloride	20.35	1.0	20	0	102	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.9*	*1.0*	*50*	*0*	*93.8*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.07*	*1.0*	*50*	*0*	*100*	*81 - 113*				
Surr: Dibromofluoromethane	*47.92*	*1.0*	*50*	*0*	*95.8*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779651** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.76*	*1.0*	*50*	*0*	*89.5*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779652** 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	70 - 120	19.9	1.5	20	
1,1,1-Trichloroethane	19.2	1.0	20	0	96.0	70 - 130	19.85	3.32	20	
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123	16.75	0.827	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	22.8	1.0	20	0	114	70 - 130	23.06	1.15	20	
1,1,2-Trichloroethane	19.9	1.0	20	0	99.5	70 - 117	19.23	3.42	20	
1,1-Dichloroethane	20.03	1.0	20	0	100	70 - 127	20.23	0.952	20	
1,1-Dichloroethene	19.86	1.0	20	0	99.3	70 - 130	21.12	6.18	20	
1,1-Dichloropropene	21.75	1.0	20	0	109	70 - 129	22.98	5.5	20	
1,2,3-Trichlorobenzene	17.13	1.0	20	0	85.6	70 - 130	16.79	1.97	20	
1,2,3-Trichloropropane	16.97	1.0	20	0	84.9	70 - 130	17.04	0.369	20	
1,2,4-Trichlorobenzene	18.81	1.0	20	0	94.0	70 - 125	18.35	2.46	20	
1,2,4-Trimethylbenzene	20.52	1.0	20	0	103	70 - 125	20.2	1.57	20	
1,2-Dibromo-3-chloropropane	15.33	1.0	20	0	76.6	70 - 130	15.11	1.44	20	
1,2-Dibromoethane	20.16	1.0	20	0	101	70 - 124	20.23	0.37	20	
1,2-Dichlorobenzene	19.28	1.0	20	0	96.4	70 - 115	18.84	2.29	20	
1,2-Dichloroethane	20.92	1.0	20	0	105	70 - 127	19.51	7.02	20	
1,2-Dichloropropane	20.94	1.0	20	0	105	70 - 122	20.81	0.596	20	
1,3,5-Trimethylbenzene	18.98	1.0	20	0	94.9	70 - 126	18.84	0.721	20	
1,3-Dichlorobenzene	19.63	1.0	20	0	98.2	70 - 119	19.38	1.28	20	
1,3-Dichloropropane	20.12	1.0	20	0	101	70 - 121	19.78	1.7	20	
1,4-Dichlorobenzene	20.06	1.0	20	0	100	70 - 114	20.14	0.375	20	
2,2-Dichloropropane	23.11	1.0	20	0	116	70 - 130	24.13	4.33	20	
2-Butanone	34.47	2.0	40	0	86.2	70 - 130	36.01	4.36	20	
2-Chlorotoluene	21.04	1.0	20	0	105	70 - 130	20.76	1.33	20	
2-Hexanone	35.39	2.0	40	0	88.5	70 - 130	35.65	0.739	20	
4-Chlorotoluene	21.03	1.0	20	0	105	70 - 130	21.04	0.0438	20	
4-Isopropyltoluene	18.45	1.0	20	0	92.3	70 - 130	18.65	1.06	20	
4-Methyl-2-pentanone	36.16	2.0	40	0	90.4	70 - 130	35.73	1.22	20	
Acetone	30.54	2.0	40	0	76.3	70 - 130	33.5	9.26	20	
Benzene	20.35	1.0	20	0	102	70 - 127	20.4	0.246	20	
Bromobenzene	19.19	1.0	20	0	96.0	70 - 115	19.03	0.872	20	
Bromochloromethane	20.28	1.0	20	0	101	70 - 127	20.07	1.03	20	
Bromodichloromethane	20.64	1.0	20	0	103	70 - 124	20.4	1.2	20	
Bromoform	18.83	1.0	20	0	94.1	70 - 129	18.89	0.357	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779652** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.95	1.0	20	0	115	70 - 130	24.14	5.05	20	
Carbon disulfide	39.61	2.0	40	0	99.0	70 - 130	40.53	2.28	20	
Carbon tetrachloride	20.83	1.0	20	0	104	70 - 130	21.38	2.61	20	
Chlorobenzene	21.12	1.0	20	0	106	70 - 114	20.81	1.47	20	
Chloroethane	18.88	1.0	20	0	94.4	70 - 130	20.23	6.88	20	
Chloroform	19.61	1.0	20	0	98.0	70 - 125	19.57	0.197	20	
Chloromethane	16.16	1.0	20	0	80.8	70 - 130	17.45	7.66	20	
cis-1,2-Dichloroethene	20.13	1.0	20	0	101	70 - 128	20.83	3.39	20	
cis-1,3-Dichloropropene	21.94	1.0	20	0	110	70 - 125	22.19	1.12	20	
Dibromochloromethane	19.44	1.0	20	0	97.2	70 - 124	19.34	0.484	20	
Dibromomethane	20.65	1.0	20	0	103	70 - 124	19.74	4.48	20	
Dichlorodifluoromethane	14.38	1.0	20	0	71.9	70 - 130	15.84	9.68	20	
Ethylbenzene	22.5	1.0	20	0	113	70 - 124	22.34	0.717	20	
Hexachlorobutadiene	19.41	1.0	20	0	97.0	70 - 130	19.43	0.114	20	
Isopropylbenzene	20.13	1.0	20	0	101	70 - 130	20.2	0.341	20	
m,p-Xylene	46.12	2.0	40	0	115	70 - 130	45.94	0.383	20	
Methylene chloride	20.76	2.0	20	0	104	70 - 128	19.93	4.07	20	
Naphthalene	15.84	1.0	20	0	79.2	70 - 130	15.61	1.43	20	
n-Butylbenzene	20.53	1.0	20	0	103	70 - 130	20.82	1.37	20	
n-Propylbenzene	21.64	1.0	20	0	108	70 - 130	21.93	1.32	20	
o-Xylene	22.18	1.0	20	0	111	70 - 124	22.17	0.0606	20	
sec-Butylbenzene	18.67	1.0	20	0	93.3	70 - 130	18.87	1.11	20	
Styrene	20.71	1.0	20	0	104	70 - 130	20.53	0.897	20	
tert-Butylbenzene	20.77	1.0	20	0	104	70 - 130	20.84	0.363	20	
Tetrachloroethene	20.55	1.0	20	0	103	70 - 130	20.61	0.29	20	
Toluene	20.33	1.0	20	0	102	70 - 123	20.26	0.353	20	
trans-1,2-Dichloroethene	21.28	1.0	20	0	106	70 - 130	21.62	1.59	20	
trans-1,3-Dichloropropene	21.79	1.0	20	0	109	70 - 121	22.47	3.08	20	
Trichloroethene	20.97	1.0	20	0	105	70 - 129	21.67	3.27	20	
Trichlorofluoromethane	20.34	1.0	20	0	102	70 - 130	21.58	5.94	20	
Vinyl chloride	19.17	1.0	20	0	95.9	70 - 130	20.35	5.96	20	
Surr: 1,2-Dichloroethane-d4	*45.87*	*1.0*	*50*	*0*	*91.7*	*70 - 126*	*46.9*	*2.21*	*20*	
Surr: 4-Bromofluorobenzene	*50.49*	*1.0*	*50*	*0*	*101*	*81 - 113*	*50.07*	*0.838*	*20*	
Surr: Dibromofluoromethane	*47.6*	*1.0*	*50*	*0*	*95.2*	*77 - 123*	*47.92*	*0.666*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779652** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.91*	*1.0*	*50*	*0*	*89.8*	*82 - 127*	*44.76*	*0.336*	*20*	

The following samples were analyzed in this batch: HS18100492-03 HS18100492-04 HS18100492-06 HS18100492-07 HS18100492-09 HS18100492-10

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325252 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW1-101018** Units: **mg/L** Analysis Date: **10-Oct-2018 21:18**
Client ID: Run ID: **ICS2100_325252** SeqNo: **4768832** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U
Chloride	0.500	0.500								U
Fluoride	0.100	0.100								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

LCS Sample ID: **WLCSW1-101018** Units: **mg/L** Analysis Date: **10-Oct-2018 21:33**
Client ID: Run ID: **ICS2100_325252** SeqNo: **4768833** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.725	0.100	4	0	93.1	80 - 120				
Chloride	20.31	0.500	20	0	102	80 - 120				
Fluoride	4.275	0.100	4	0	107	80 - 120				
Nitrogen, Nitrate (As N)	3.98	0.100	4	0	99.5	80 - 120				
Nitrogen, Nitrite (As N)	4.243	0.100	4	0	106	80 - 120				
Sulfate	20.22	0.500	20	0	101	80 - 120				

LCSD Sample ID: **WLCSDW1-101018** Units: **mg/L** Analysis Date: **10-Oct-2018 21:47**
Client ID: Run ID: **ICS2100_325252** SeqNo: **4768834** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.677	0.100	4	0	91.9	80 - 120	3.725	1.3	20	
Chloride	20.01	0.500	20	0	100	80 - 120	20.31	1.49	20	
Fluoride	4.223	0.100	4	0	106	80 - 120	4.275	1.22	20	
Nitrogen, Nitrate (As N)	3.915	0.100	4	0	97.9	80 - 120	3.98	1.65	20	
Nitrogen, Nitrite (As N)	4.181	0.100	4	0	105	80 - 120	4.243	1.47	20	
Sulfate	20.01	0.500	20	0	100	80 - 120	20.22	1.02	20	

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325252 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MS Sample ID: **HS18100492-08MS** Units: **mg/L** Analysis Date: **11-Oct-2018 04:49**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768840** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.24	0.100	2	1.257	99.2	80 - 120				
Chloride	290.3	0.500	10	273.9	164	80 - 120				SEO
Fluoride	2.345	0.100	2	0.319	101	80 - 120				
Nitrogen, Nitrite (As N)	2.22	0.100	2	0	111	80 - 120				
Sulfate	885.2	0.500	10	852.3	330	80 - 120				SEO

MS Sample ID: **HS18100492-08MS** Units: **mg/L** Analysis Date: **11-Oct-2018 06:02**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768845** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	19.39	1.00	20	1.766	88.1	80 - 120				
Chloride	380.1	5.00	100	286.7	93.5	80 - 120				
Fluoride	21.6	1.00	20	0	108	80 - 120				
Nitrogen, Nitrate (As N)	23.12	1.00	20	0	116	80 - 120				
Nitrogen, Nitrite (As N)	21.15	1.00	20	0	106	80 - 120				
Sulfate	965.3	5.00	100	904.7	60.6	80 - 120				SO

MS Sample ID: **HS18100492-08MS** Units: **mg/L** Analysis Date: **11-Oct-2018 14:23**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768869** PrepDate: DF: **20**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	35.51	2.00	40	2.318	83.0	80 - 120				
Chloride	455.1	10.0	200	271.7	91.7	80 - 120				
Fluoride	40.46	2.00	40	1.826	96.6	80 - 120				
Nitrogen, Nitrate (As N)	42.02	2.00	40	0	105	80 - 120				
Nitrogen, Nitrite (As N)	40.58	2.00	40	0	101	80 - 120				
Sulfate	992.9	10.0	200	853.2	69.9	80 - 120				SO

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325252 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MS Sample ID: **HS18100492-08MS** Units: **mg/L** Analysis Date: **11-Oct-2018 12:28**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768864** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.22	0.100	2	1.315	95.2	80 - 120				
Chloride	292.7	0.500	10	280.7	120	80 - 120				EO
Fluoride	2.368	0.100	2	0.326	102	80 - 120				
Nitrogen, Nitrite (As N)	2.198	0.100	2	0	110	80 - 120				
Sulfate	888.8	0.500	10	870.9	179	80 - 120				SEO

MSD Sample ID: **HS18100492-08MSD** Units: **mg/L** Analysis Date: **11-Oct-2018 06:16**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768846** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	19.26	1.00	20	1.766	87.5	80 - 120	19.39	0.704	20	
Chloride	376.5	5.00	100	286.7	89.9	80 - 120	380.1	0.953	20	
Fluoride	21.03	1.00	20	0	105	80 - 120	21.6	2.72	20	
Nitrogen, Nitrate (As N)	23.01	1.00	20	0	115	80 - 120	23.12	0.451	20	
Nitrogen, Nitrite (As N)	21.02	1.00	20	0	105	80 - 120	21.15	0.626	20	
Sulfate	957.5	5.00	100	904.7	52.8	80 - 120	965.3	0.811	20	SO

MSD Sample ID: **HS18100492-08MSD** Units: **mg/L** Analysis Date: **11-Oct-2018 12:47**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768865** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.14	0.100	2	1.315	91.2	80 - 120	3.22	2.52	20	
Chloride	283	0.500	10	280.7	22.8	80 - 120	292.7	3.37	20	SEO
Fluoride	2.23	0.100	2	0.326	95.2	80 - 120	2.368	6	20	
Nitrogen, Nitrite (As N)	2.105	0.100	2	0	105	80 - 120	2.198	4.32	20	
Sulfate	865.7	0.500	10	870.9	-51.5	80 - 120	888.8	2.62	20	SEO

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: **R325252 (0)** **Instrument:** **ICS2100** **Method:** **ANIONS BY SW9056A**

MSD Sample ID: **HS18100492-08MSD** Units: **mg/L** Analysis Date: **11-Oct-2018 14:38**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768870** PrepDate: DF: **20**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	37.04	2.00	40	2.318	86.8	80 - 120	35.51	4.23	20	
Chloride	473.2	10.0	200	271.7	101	80 - 120	455.1	3.91	20	
Fluoride	42.38	2.00	40	1.826	101	80 - 120	40.46	4.64	20	
Nitrogen, Nitrate (As N)	43.92	2.00	40	0	110	80 - 120	42.02	4.42	20	
Nitrogen, Nitrite (As N)	42.26	2.00	40	0	106	80 - 120	40.58	4.06	20	
Sulfate	1032	10.0	200	853.2	89.4	80 - 120	992.9	3.86	20	O

MSD Sample ID: **HS18100492-08MSD** Units: **mg/L** Analysis Date: **11-Oct-2018 05:03**
Client ID: **16WW24-181009** Run ID: **ICS2100_325252** SeqNo: **4768841** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.109	0.100	2	1.257	92.6	80 - 120	3.22	3.51	20	
Chloride	277.8	0.500	10	273.9	39.5	80 - 120	292.7	5.21	20	SEO
Fluoride	2.258	0.100	2	0.319	97.0	80 - 120	2.368	4.76	20	
Nitrogen, Nitrite (As N)	2.142	0.100	2	0	107	80 - 120	2.198	2.58	20	
Sulfate	848.5	0.500	10	852.3	-37.9	80 - 120	888.8	4.64	20	SEO

The following samples were analyzed in this batch: HS18100492-02 HS18100492-03 HS18100492-04 HS18100492-05 HS18100492-06 HS18100492-07 HS18100492-08 HS18100492-09 HS18100492-10

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100492

QC BATCH REPORT

Batch ID: R325372 (0) **Instrument:** ManTech01 **Method:** ALKALINITY BY SM2320B

MBLK Sample ID: **WBLKW1-181012** Units: **mg/L** Analysis Date: **12-Oct-2018 20:03**
Client ID: Run ID: **ManTech01_325372** SeqNo: **4771186** 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

LCS Sample ID: **WLCSw1-181012** Units: **mg/L** Analysis Date: **12-Oct-2018 20:12**
Client ID: Run ID: **ManTech01_325372** SeqNo: **4771187** 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				

LCSD Sample ID: **WLCSDw1-181012** Units: **mg/L** Analysis Date: **12-Oct-2018 20:22**
Client ID: Run ID: **ManTech01_325372** SeqNo: **4771188** 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)	1079	5.00	1000	0	108	85 - 115	1077	0.153	20	

DUP Sample ID: **HS18100492-08DUP** Units: **mg/L** Analysis Date: **12-Oct-2018 22:55**
Client ID: **16WW24-181009** Run ID: **ManTech01_325372** SeqNo: **4771211** 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					0	0	20	U

The following samples were analyzed in this batch:

HS18100492-02	HS18100492-03	HS18100492-04	HS18100492-05
HS18100492-06	HS18100492-07	HS18100492-08	HS18100492-09
HS18100492-10			

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS18100492**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/L	Milligrams per Liter

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100492

Date/Time Received: **10-Oct-2018 09:15**
Received by: **JRM**

Checklist completed by: *Jared R. Makan* eSignature 10-Oct-2018 Date

Reviewed by: *RJ Modashia* eSignature 11-Oct-2018 Date

Matrices: **Water**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s): 2.1c/1.8c, 2.7c/1.4c UC/C | IR25

Cooler(s)/Kit(s): Blue

Date/Time sample(s) sent to storage: 10/10/2018 15:10

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes: Sx collection times differ 16WW43: COC=0949, Sx=0950, 16WW26: COC=1118, Sx=1120, 16WW25: COC=1312, Sx=1315, 16WW36: COC=1453, Sx=1455. Sx 16WW43 ID differs on Perchlorate bottle: bottle label = 16WW44. Id'd by collection date/time, logged in as 16WW43.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181009 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-50			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060
16TB01-181009	FIELD QC				LIQ	10/9/2018	830	2		2					
16WW43-181009	16WW43	10.38	11.37	FT	GW	10/9/2018	949	11		3	1	1	1	3	2
16WW26-181009	16WW26	18.39	19.39	FT	GW	10/9/2018	1118	11		3	1	1	1	3	2
16WW41-181009	16WW41	27.73	28.24	FT	GW	10/9/2018	1125	11		3	1	1	1	3	2
16WW25-181009	16WW25	19.28	19.67	FT	GW	10/9/2018	1312	11		3	1	1	1	3	2
16EW02-181009	16EW02	24.4	24.59	FT	GW	10/9/2018	1340	11		3	1	1	1	3	2
16WW36-181009	16WW36	18.88	19.41	FT	GW	10/9/2018	1453	11		3	1	1	1	3	2
16WW24-181009	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11		3	1	1	1	3	2
16WW24-181009-FD	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11		3	1	1	1	3	2
16WW24-181009-MS	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11		3	1	1	1	3	2
16WW24-181009-MSD	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11		3	1	1	1	3	2
16EW06-181009	16EW06	24.15	24.33	FT	GW	10/9/2018	1455	11		3	1	1	1	3	2

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant
HS18100492

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	APTIM	10/9/18 1800	J. [illegible] / ALS	10/12/18 09:15

Cooler - Blue
Temp 2.1
IR25 CF-0.3

Cooler - Blue-Green
Temp 2.7
IR25 CF-0.3

APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181009

TURNAROUND TIME: normal

RUSH:

Page 1 of 1

PROJECT/CLIENT INFO

Facility Name	Longhorn AAP
Project Number	501032
	LHAAP-50
Address	1203-B East Grand Avenue
	PMB 202
City	Marshall
State	TX
Postal Code	75670
Country	USA
Phone Number	713.243.7264
Project Manager	Praveen Srivastav

LABORATORY

Lab Name	ALS Laboratories
Lab Contact	RJ Modashia
Email	RJ.Modashia@alsglobal.com
Address	10450 Stancliff Rd., Suite 210
City	Houston
State	TX
Postal Code	77099
Country	USA
Phone Number	281.575.2279 or 281.530.5656

OTHER INFO

Email Invoice To	FedInvoices@aptim.com
Email Report To	kim.napier@aptim.com
Mail Reports To	Kim Napier
Address	2410 Cherahala Blvd.
City	Knoxville
State	TN
Postal Code	37932
Country	USA
Shipping Company	FED EX

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060				
16TB01-181009	FIELD QC				LIQ	10/9/2018	830	2	2									
16WW43-181009	16WW43	10.38	11.37	FT	GW	10/9/2018	949	11	3	1	1	1	3	2				
16WW26-181009	16WW26	18.39	19.39	FT	GW	10/9/2018	1118	11	3	1	1	1	3	2				
16WW41-181009	16WW41	27.73	28.24	FT	GW	10/9/2018	1125	11	3	1	1	1	3	2				
16WW25-181009	16WW25	19.28	19.67	FT	GW	10/9/2018	1312	11	3	1	1	1	3	2				
16EW02-181009	16EW02	24.4	24.59	FT	GW	10/9/2018	1340	11	3	1	1	1	3	2				
16WW36-181009	16WW36	18.88	19.41	FT	GW	10/9/2018	1453	11	3	1	1	1	3	2				
16WW24-181009	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11	3	1	1	1	3	2				
16WW24-181009-FD	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11	3	1	1	1	3	2				
16WW24-181009-MS	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11	3	1	1	1	3	2				
16WW24-181009-MSD	16WW24	10.17	11.1	FT	GW	10/9/2018	1445	11	3	1	1	1	3	2				
16EW06-181009	16EW06	24.15	24.33	FT	GW	10/9/2018	1455	11	3	1	1	1	3	2				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
[illegible] APTIM	10/9/18 1800	J. MALONY / ALS	10/10/18 09:15

Cooler - Blue 1125
Temp 2.7 CF-0.3

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
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Fax. +1 281 530 5887

CUSTODY SEAL
Date: 10-09-18 Time: 185
Name:
Company:

Seal Broken By:
Date: 10/10/18

CUSTODY SEAL
DATE: 10-09-18
Signature:
LHAAP

OCT 10 2018

CUSTODY SEAL
DATE: 10-09-18 10/10/18
Signature:
LHAAP

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP-18-BO 61499-RI
RMA:

FedEx Express

FedEx
TRK# 4380 9533 1155
0221

WED - 10 OCT 10:30A
PRIORITY OVERNIGHT

AB SGI

77099
TX-US IAH

RIGHT SOLUTIONS | RIGHT PARTNER

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656 Blue - Green
Fax. +1 281 530 5887

Date: Oct. 7-8
Time:
Company:

Seal Broken By:
Date: 10/10/18

Blue - Green OCT 1 0 2016

CUSTODY SEAL
DATE: 10-09-18
Signature:
LHAAP

Blue Green
CUSTODY SEAL
DATE: 10-09-18
Signature:
LHAAP

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD Blue - Green
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP-16- BO 61490-RJ
RMA:

FedEx Express

FedEx
TRK# (0221) 4380 9533 0377

WED - 10 OCT 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US IAH

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828235; 1828552

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2155 (225024)

General Set Information: There were ten field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: NA

Method QC data: The method blank (LMB 623352) was less than 1/2 the CRDL. The recovery for the LCS (623353) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 1828552008/09 (Client ID: 16WW24-181009). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The percent recoveries and relative percent difference (RPD) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1. Due to limitations of the Chemstation Software, some of the chromatographic peaks require manual integration. Manual integrations were performed for datafiles 17OCTP09-12/19.

Thomas Bosch October 22, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 22, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1828552**
Project ID: HS18100492 100918
Purchase Order: HS18100492
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW43-181009	1828552001	10/09/18	10/11/18	
16WW26-181009	1828552002	10/09/18	10/11/18	
16WW41-181009	1828552003	10/09/18	10/11/18	
16WW25-181009	1828552004	10/09/18	10/11/18	
16WW02-181009	1828552005	10/09/18	10/11/18	
16WW36-181009	1828552006	10/09/18	10/11/18	
16WW24-181009	1828552007	10/09/18	10/11/18	
16WW24-181009-FD	1828552010	10/09/18	10/11/18	
16WW06-181009	1828552011	10/09/18	10/11/18	

Client QC ID *	Lab ID	Collect Date	Receive Date	Sampling Site
16WW24-181009MS	1828552008	10/09/18	10/11/18	
16WW24-181009MSD	1828552009	10/09/18	10/11/18	

***Client QC is reported as part of the Quality Control results report, if requested.**

ANALYTICAL REPORT

Workorder: 34-1828552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW43-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552001 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 10:05 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW26-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552002 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 10:19 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW41-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552003 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 10:34 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**60**	1.0	2.0	4.0	1	

Sample ID: **16WW25-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552004 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 10:48 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

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ANALYTICAL REPORT

Workorder: 34-1828552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW02-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552005 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 11:02 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW36-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552006 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 11:16 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW24-181009** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552007 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 11:30 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW24-181009-FD** | Sampling Site: NA | Collected: 10/09/2018
Lab ID: 1828552010 | Media: 125 mL Nalgene | Received: 10/11/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2155 (HBN: 225024) | **Percent Solid:** NA
Analyzed: 10/17/2018 12:13 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

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ANALYTICAL REPORT

Workorder: 34-1828552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID:	16WW06-181009	Sampling Site:	NA	Collected:	10/09/2018
Lab ID:	1828552011	Media:	125 mL Nalgene	Received:	10/11/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation:	Not Applicable	**Analysis:**	EPA 6850, DoD QSM Water
		Batch:	ELMS/2155 (HBN: 225024)
		Analyzed:	10/17/2018 13:01
Instrument ID:	LCMS04		
Percent Solid:	NA		
Report Basis:	Wet		

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Report Authorization

(/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/19/2018 15:23	/S/ Stephen Brose 10/22/2018 13:43

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1828552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1828552

Limits: Client SOW/Contract Specified
Basis: DoD QSM
Preparation: NA
Batch: NA
Prepared By: NA
Analysis: EPA 6850, DoD QSM
Batch: ELMS/2155 (HBN: 225024)
Analyzed By: Thomas Bosch

Blank

LMB: 623352
Analyzed: 10/17/2018 09:21
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 623353
Analyzed: 10/17/2018 09:35
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.74	5.00	94.9	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828552007
Analyzed: 10/17/2018 11:30
Dilution: 1
Units: ug/L

MS: 1828552008
Analyzed: 10/17/2018 11:44
Dilution: 1
Units: ug/L

MSD: 1828552009
Analyzed: 10/17/2018 11:58
Dilution: 1
Units: ug/L

Analyte	Result	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Perchlorate	ND	3.94	5	78.9	78.8	123.8	4.09	81.9	3.7	0.0	20.0

Continuing Calibration Verification

CCV: 623349
Analyzed: 10/17/2018 08:37
Units: ug/L
Criteria: ± 15%

CCV: 623354
Analyzed: 10/17/2018 12:30
Units: ug/L
Criteria: ± 15%

CCV: 623466
Analyzed: 10/17/2018 14:12
Units: ug/L
Criteria: ± 15%

Analyte	Result	Target	% Rec.	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	24.6	25.0	98.4	23.9	25.0	95.5	24.5	25.0	98.0

Interference Check Sample

ICSA: 623351
Analyzed: 10/17/2018 09:07
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	1.05	1.00	105

Limit of Detection Verification

LODV: 623350
Analyzed: 10/17/2018 08:53
Units: ug/L
Criteria: ± 50%

LODV: 623355
Analyzed: 10/17/2018 12:44
Units: ug/L
Criteria: ± 50%

LODV: 623467
Analyzed: 10/17/2018 14:26
Units: ug/L
Criteria: ± 50%

Analyte	Result	Target	% Rec.	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	0.968	1.00	96.8	0.984	1.00	98.4	1.02	1.00	102

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1828552**

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2155 (HBN: 225024)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/19/2018 15:23	10/22/2018 13:43

Symbols and Definitions

- * - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ● - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

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www.alsglobal.com

W 1828552

tract Chain of Custody

COC ID: 9987

1828552

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	HS18100492
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100492-02**	**16WW43-181009**	**Water**	**09 Oct 2018 09:49**
	SUB_Perch-6850			18 Oct 2018
2.	**HS18100492-03**	**16WW26-181009**	**Water**	**09 Oct 2018 11:18**
	SUB_Perch-6850			18 Oct 2018
3.	**HS18100492-04**	**16WW41-181009**	**Water**	**09 Oct 2018 11:25**
	SUB_Perch-6850			18 Oct 2018
4.	**HS18100492-05**	**16WW25-181009**	**Water**	**09 Oct 2018 13:12**
	SUB_Perch-6850			18 Oct 2018
5.	**HS18100492-06**	**16WW02-181009**	**Water**	**09 Oct 2018 13:40**
	SUB_Perch-6850			18 Oct 2018
6.	**HS18100492-07**	**16WW36-181009**	**Water**	**09 Oct 2018 14:53**
	SUB_Perch-6850			18 Oct 2018
7.	**HS18100492-08**	**16WW24-181009**	**Water**	**09 Oct 2018 14:45** MS/MSD
	SUB_Perch-6850			18 Oct 2018
8.	**HS18100492-09**	**16WW24-181009-FD**	**Water**	**09 Oct 2018 14:45**
	SUB_Perch-6850			18 Oct 2018
9.	**HS18100492-10**	**16WW06-181009**	**Water**	**09 Oct 2018 14:55**

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Subcontract Chain of Custody

COC ID: 9987

LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
ANALYSIS REQUESTED			DUE DATE
SUB_Perch-6850			18 Oct 2018

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

HS18100492-08 MS/MSD

QC Level: DOD IV (DoD Data Package)

Relinquished By: J. [illegible] Date/Time: 10/10/18 18:00

Received By: [illegible] Date/Time: 10/11/18 9:50

Cooler ID(s): Temperature(s):

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100492 | **Split:** | **Workorder ID:** 1828552 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
1	10/09/2018 09:49	16WW43-181009	1828552001		Water	A	1	A
2	10/09/2018 11:18	16WW26-181009	1828552002		Water	A	1	A
3	10/09/2018 11:25	16WW41-181009	1828552003		Water	A	1	A
4	10/09/2018 13:12	16WW25-181009	1828552004		Water	A	1	A
5	10/09/2018 13:40	16WW02-181009	1828552005		Water	A	1	A
6	10/09/2018 14:53	16WW36-181009	1828552006		Water	A	1	A
7	10/09/2018 14:45	16WW24-181009	1828552007		Water	A	1	A
8	10/09/2018 14:45	16WW24-181009MS	1828552008	MS	Water	A	1	A
9	10/09/2018 14:45	16WW24-181009MSD	1828552009	MSD	Water	A	1	A
10	10/09/2018 14:45	16WW24-181009-FD	1828552010	FLDDUP	Water	A	1	A

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/11/2018 09:50	ALS Sample Receiving	Sample Login
Julie Warath	10/12/18 1140	14B	Storage
R-33.1	10-16-18/11:07	T. Bosch	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

Fri, 10/12/18 11:35 AM

ALSCOCV3.1

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100492 | **Split:** | **Workorder ID:** 1828552 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	Requested Analysis: EPA 6850, DoD QSM
11	10/09/2018 14:55	16WW06-181009	1828552011		Water	A	1	A
12								
13								
14								
15								
16								
17								
18								
19								
20								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/11/2018 09:50	ALS Sample Receiving	Sample Login
Julie Warath	10/12/18 1140	14B	storage
R-33.1	10-16-18/11:07	T. Bosch	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

1828552

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: HS18100492/ 9987

Date/Time of Receipt: 10/11/2018 9:50

Number of Coolers Received: 1

Condition of Coolers: Acceptable/Unacceptable

Cooler Custody Seals: Present/Absent/NA
Intact/Broken/NA

Container Custody Seals: Present/Absent/NA
Intact/Broken/NA

Ice Present: Yes/No/NA
Frozen/Melted/NA

Temperature Control: Present/Not Included

Location Temp Taken: Control/Between Samples

Are all temperatures within project specific guidelines? Yes/No/NA

VOA Headspace Present? Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8817	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Desiree Hill (Signature) Desiree Hill (Printed Name) 10/11/2018 (Date)

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Residual Chlorine Present
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

For sample HS18100492-8 has 3 containers to include MS/MSD.

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Part # 159469-434 RIT2 EXP 07/19

Must Deliver Next Business Day
Time and Tempature Sensitive!

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 10OCT18
ACTWGT: 21.10 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

5S1C1/88FB/104C

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18100492 RM

FedEx Express

J181111806050 1uv

TRK# 0201 **4380 9533 4012**

THU - 11 OCT 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

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Batch Worklist

Batch: ELMS/ 2155 **Created:** 10/17/2018 07:46 **Instrument:** **HBN:** 225024

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828235 [ENV_LVL4]
Workorder: 1828552 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	623349	CCV for HBN 225024 [ELMS/2155]				CCV	3		E685041C3Q	5311		10/22/2018	
2	623350	LODV for HBN 225024 [ELMS/2155				LODV	3		E6850..D3Q	5311		10/22/2018	
3	623351	ICS for HBN 225024 [ELMS/2155]				ICS	3		E6850..D3Q	5311		10/22/2018	
4	623352	LMB for HBN 225024 [ELMS/2155]				LMB	3		E6850Q413Q	5311		10/22/2018	
5	623353	LCS for HBN 225024 [ELMS/2155]				LCS	3		E6850Q413Q	5311		10/22/2018	
6	1828235001	LH18/24-SP650_100418_BIX				SAMPLE	3	1828235001-A	E6850Q41.3	5480	11/1/2018	10/22/2018	
7	1828552001	16WW43-181009				SAMPLE	3	1828552001-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
8	1828552002	16WW26-181009				SAMPLE	3	1828552002-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
9	1828552003	16WW41-181009				SAMPLE	3	1828552003-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
10	1828552004	16WW25-181009				SAMPLE	3	1828552004-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
11	1828552005	16WW02-181009				SAMPLE	3	1828552005-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
12	1828552006	16WW36-181009				SAMPLE	3	1828552006-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
13	1828552007	16WW24-181009				SAMPLE	3	1828552007-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
14	1828552008	16WW24-181009MS				MS	3	1828552008-A	E6850Q413Q	5480		10/22/2018	
15	1828552009	16WW24-181009MSD				MSD	3	1828552009-A	E6850Q413Q	5480		10/22/2018	
16	1828552010	16WW24-181009-FD				FLDDUP	3	1828552010-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
17	1828552011	16WW06-181009				SAMPLE	3	1828552011-A	E6850Q41.3	5480	11/6/2018	10/24/2018	
18	623354	CCV for HBN 225024 [ELMS/2155]				CCV	3		E685041C3Q	5311		10/22/2018	
19	623355	LODV for HBN 225024 [ELMS/2155				LODV	3		E6850..D3Q	5311		10/22/2018	
20	623466	CCV for HBN 225024 [ELMS/2155]				CCV	3		E685041C3Q	5311		10/22/2018	
21	623467	LODV for HBN 225024 [ELMS/2155				LODV	3		E6850..D3Q	5311		10/22/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828235 (001); 1828552 (001-15)
ELMS Batch/HBN ID: 2155 (225024)
Prep Date: 10/15/2018 Analysis Date: 10/17/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\17OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 623353; Target = 5.0µg/L. ASTM type II water was used for LMB 623352.

MS/MSD: MS/MSD was performed on samples 1828552008/09 (Client ID: 16WW24-181009). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:
1) Results reported in µg/L. Samples 1828552005/06/11 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225024-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#
5) Due to limitations of the Chemstation Software, some of the chromatographic peaks require manual integration. Manual integrations were performed for datafiles 17OCTP09-12/19.

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria Batch(es)/SDG: ELMS: 2155 (HBN: 225024) Sample Set IDs if Applicable: 1828235 / 1828552	Analyst Initials	Reviewer Initials
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

T.B, 10.22.18
SB 10/22/18

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STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK	Description - 6850 WKG Std 100.ug/L

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard: 43659
MFG: AccuStandard
MFG Lot: 218065075
Part ID: IC-PER-10X-1

Created By: Thomas Bosch
Create Date: 09/17/2018 09:09AM

Amount: 100 mL
Expires: 07/25/2020
Usable: No
Lab Lot: CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		**Description - ASTM Type II Water**
Standard: **109**	**Created By:** ALS Support (Lims)	**Amount:** 1000 L
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025
MFG Lot: Not Provided		**Usable:** Yes
Part ID: Not Provided		**Lab Lot:** LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description - 6850 QC Stock STD 1,000ug/mL**

Standard: 36748	**Created By:** Thomas Bosch	**Amount:** 100 mL
MFG: Ultra Scientific	**Create Date:** 05/11/2017 01:05PM	**Expires:** 03/31/2020
MFG Lot: CP-0860		**Usable:** Yes
Part ID: ICC-013		**Lab Lot:** CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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ALS

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK — **Description - Perchlorate ISTD Wrk 1,000ug/L**

Standard:	**43730**	**Created By:**	Thomas Bosch	**Amount:**	25 mL
MFG:	ALS/SLC	**Create Date:**	09/20/2018 09:09AM	**Expires:**	09/20/2019
MFG Lot:	TNB: 05/09/2018	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Pipette ID:	Not Provided	**Verify Date:**		**Lab Lot:**	CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK — **Description - Perchlorate ISTD Stock**

Standard:	43729	**Created By:**	Thomas Bosch	**Amount:**	1 mL
MFG:	Cambridge Isotope	**Create Date:**	09/20/2018 09:09AM	**Expires:**	04/28/2026
MFG Lot:	SDFF-012A	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Part ID:	OLM-7310-S	**Verify Date:**		**Lab Lot:**	CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED ANAB ACCREDITED

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ISO 9001 Registered Quality System – TUV USA
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125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

* *For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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October 22, 2018

Analytical Report for Service Request No: K1809960

RJ Modashia
ALS Laboratory Group
10450 Stancliff Road
Suite 210
Houston, TX 77099-4338

RE: HS18100492

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 11, 2018
For your reference, these analyses have been assigned our service request number **K1809960.**

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. 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.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

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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.

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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.

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	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 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/anlayte is offered by that state.

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Case Narrative

ALS Environmental—Kelso Laboratory
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ALS Environmental

Client: ALS Environmental - US
Project: HS18100492
Sample Matrix: Water

Service Request: K1809960
Date Received: 10/11/2018

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:

Nine water samples were received for analysis at ALS Environmental on 10/11/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Kelley Lovejoy

Date 10/22/2018

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Chain of Custody

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Page 6 of 41

K1809960

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Subcontract Chain of Custody

COC ID: 9988

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:	HS18100492
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100492-02**	**16WW43-181009**	**Water**	**09 Oct 2018 09:49**
	TOC Analysis with DOD Level IV			18 Oct 2018
2.	**HS18100492-03**	**16WW26-181009**	**Water**	**09 Oct 2018 11:18**
	TOC Analysis with DOD Level IV			18 Oct 2018
3.	**HS18100492-04**	**16WW41-181009**	**Water**	**09 Oct 2018 11:25**
	TOC Analysis with DOD Level IV			18 Oct 2018
4.	**HS18100492-05**	**16WW25-181009**	**Water**	**09 Oct 2018 13:12**
	TOC Analysis with DOD Level IV			18 Oct 2018
5.	**HS18100492-06**	**16WW02-181009**	**Water**	**09 Oct 2018 13:40**
	TOC Analysis with DOD Level IV			18 Oct 2018
6.	**HS18100492-07**	**16WW36-181009**	**Water**	**09 Oct 2018 14:53**
	TOC Analysis with DOD Level IV			18 Oct 2018
QC 7.	**HS18100492-08**	**16WW24-181009**	**Water**	**09 Oct 2018 14:45**
	TOC Analysis with DOD Level IV			18 Oct 2018
8.	**HS18100492-09**	**16WW24-181009-FD**	**Water**	**09 Oct 2018 14:45**
	TOC Analysis with DOD Level IV			18 Oct 2018
9.	**HS18100492-10**	**16WW06-181009**	**Water**	**09 Oct 2018 14:55**

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Subcontract Chain of Custody

COC ID: 9988

LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
ANALYSIS REQUESTED			DUE DATE
TOC Analysis with DOD Level IV			18 Oct 2018

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

HS18100492-08 MS/MSD

QC Level: DOD IV (DoD Data Package)

Relinquished By: J. Munroe Date/Time: 10/10/18 18:00

Received By: R Morrow ALS Kelso Date/Time: 10/11/18 0920

Cooler ID(s): Temperature(s):

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01029221

PC KL

Cooler Receipt and Preservation Form

Client ALS-Houston Service Request *K18* 09960

Received: 10/11/18 Opened: 10/11/18 By: [illegible] Unloaded: 10/11/18 By: [illegible]

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? 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 NA	Tracking Number NA	Filed
-0.8	-0.6	N/A	N/A	+0.2	308	9988	Accidentally Discarded.	
		1.9	2.1					

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: _____

RUSH

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General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1809960
Project:	HS18100492	**Date Collected:**	10/9/18
Sample Matrix:	Water	**Date Received:**	10/11/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
16WW43-181009	K1809960-001	**9.46**	0.50	0.20	0.07	1	10/18/18 01:39	
16WW26-181009	K1809960-002	**5.03**	0.50	0.20	0.07	1	10/18/18 02:11	
16WW41-181009	K1809960-003	**58**	10	4	2	20	10/18/18 03:16	
16WW25-181009	K1809960-004	**23.8**	0.50	0.20	0.07	1	10/18/18 03:47	
16WW02-181009	K1809960-005	**10.3**	0.50	0.20	0.07	1	10/18/18 04:19	
16WW36-181009	K1809960-006	**33**	10	4	2	20	10/18/18 04:51	
16WW24-181009	K1809960-007	**2.76**	0.50	0.20	0.07	1	10/18/18 05:23	
16WW24-181009-FD	K1809960-008	**2.65**	0.50	0.20	0.07	1	10/18/18 06:27	
16WW06-181009	K1809960-009	**31**	10	4	2	20	10/18/18 06:59	
Method Blank	K1809960-MB1	ND U	0.50	0.20	0.07	1	10/17/18 23:15	
Method Blank	K1809960-MB2	ND U	0.50	0.20	0.07	1	10/18/18 08:36	

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809960
Project	HS18100492	**Date Collected:**	10/09/18
Sample Matrix:	Water	**Date Received:**	10/11/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**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
16WW43-181009	K1809960-001DUP	0.50	0.20	0.07	9.46	9.32	9.39	1	10	10/18/18
16WW26-181009	K1809960-002DUP	0.50	0.20	0.07	5.03	4.74	4.89	6	10	10/18/18
16WW41-181009	K1809960-003DUP	10	4	2	58	56	57.0	4	10	10/18/18
16WW25-181009	K1809960-004DUP	0.50	0.20	0.07	23.8	23.3	23.5	2	10	10/18/18
16WW02-181009	K1809960-005DUP	0.50	0.20	0.07	10.3	9.86	10.1	5	10	10/18/18
16WW36-181009	K1809960-006DUP	10	4	2	33	33	33.0	2	10	10/18/18
16WW24-181009	K1809960-007DUP	0.50	0.20	0.07	2.76	2.51	2.64	9	10	10/18/18
16WW24-181009-FD	K1809960-008DUP	0.50	0.20	0.07	2.65	2.46	2.56	7	10	10/18/18
16WW06-181009	K1809960-009DUP	10	4	2	31	32	31.5	6	10	10/18/18

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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809960
Project:	HS18100492	**Date Collected:**	10/09/18
Sample Matrix:	Water	**Date Received:**	10/11/18
		Date Analyzed:	10/18/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	16WW24-181009	**Units:**	mg/L
Lab Code:	K1809960-007	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1809960-007MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	2.76	27.6	25.0	99	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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809960
Project:	HS18100492	**Date Analyzed:**	10/17/18
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	611322

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809960-LCS1	21.6	21.9	99	83-117
Lab Control Sample	K1809960-LCS2	21.4	21.9	98	83-117

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1809960
Project: HS18100492

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	611322	KQ1814953-06	10/17/18 22:41	25.0	23.9	95	90-110
CCV2	611322	KQ1814953-07	10/18/18 02:43	25.0	24.4	98	90-110
CCV3	611322	KQ1814953-08	10/18/18 08:02	25.0	24.0	96	90-110
CCV4	611322	KQ1814953-09	10/18/18 12:20	25.0	23.8	95	90-110
CCV5	611322	KQ1814953-10	10/18/18 14:30	25.0	23.7	95	90-110

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**K1809960
Project: HS18100492

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	611322	KQ1814953-01	10/17/18 22:58	0.50	0.20	0.07	ND	U
CCB2	611322	KQ1814953-02	10/18/18 02:59	0.50	0.20	0.07	0.09	J
CCB3	611322	KQ1814953-03	10/18/18 08:19	0.50	0.20	0.07	ND	U
CCB4	611322	KQ1814953-04	10/18/18 12:37	0.50	0.20	0.07	ND	U
CCB5	611322	KQ1814953-05	10/18/18 14:46	0.50	0.20	0.07	ND	U

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March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100548**

Laboratory Results for: **Longhorn Army Ammunition Plant LHAAP 50**

Dear Susan,

ALS Environmental received 14 sample(s) on Oct 11, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Work Order: HS18100548

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100548-01	16TB02-181010	Water	VBLKW 092618-19	10-Oct-2018 08:30	11-Oct-2018 09:05	☐
HS18100548-02	16WW38-181010	Groundwater		10-Oct-2018 09:49	11-Oct-2018 09:05	☐
HS18100548-03	16WW44-181010	Groundwater		10-Oct-2018 10:05	11-Oct-2018 09:05	☐
HS18100548-04	16WW33-181010	Groundwater		10-Oct-2018 10:20	11-Oct-2018 09:05	☐
HS18100548-05	16WW37-181010	Groundwater		10-Oct-2018 10:39	11-Oct-2018 09:05	☐
HS18100548-06	16WW45-181010	Groundwater		10-Oct-2018 11:10	11-Oct-2018 09:05	☐
HS18100548-07	16WW14-181010	Groundwater		10-Oct-2018 12:02	11-Oct-2018 09:05	☐
HS18100548-08	16WW34-181010	Groundwater		10-Oct-2018 13:05	11-Oct-2018 09:05	☐
HS18100548-09	16WW35-181010	Groundwater		10-Oct-2018 13:11	11-Oct-2018 09:05	☐
HS18100548-10	16WW16-181010	Groundwater		10-Oct-2018 13:15	11-Oct-2018 09:05	☐
HS18100548-11	16WW31-181010	Groundwater		10-Oct-2018 14:30	11-Oct-2018 09:05	☐
HS18100548-12	16WW31-181010-FD	Groundwater		10-Oct-2018 14:30	11-Oct-2018 09:05	☐
HS18100548-13	16WW22-181010	Groundwater		10-Oct-2018 15:00	11-Oct-2018 09:05	☐
HS18100548-14	16WW39-181010	Groundwater		10-Oct-2018 15:39	11-Oct-2018 09:05	☐

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Work Order: HS18100548

CASE NARRATIVE

Work Order Comments

- Revised to updated the VOC list.
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.
- The analysis for TOC was subcontracted to ALS Kelso WA. Final report attached.

GC Semivolatiles by Method RSK-175

Batch ID: R325736

Sample ID: HS18100713-02MS

- MS and MSD are for an unrelated sample

GCMS Volatiles by Method SW8260

Batch ID: R325746

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Batch ID: R325772

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Sample ID: VLCSW-181018

- Ethylbenzene exceeded %recovery limits on LCS. Samples ND.

Batch ID: R325826

Sample ID: HS18100727-08MS

- MS and MSD were performed on unrelated sample.

WetChemistry by Method SM2320B

Batch ID: R325562

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R325461

Sample ID: 16WW35-181010 (HS18100548-09)

- The reporting limit is elevated due to dilution for high concentrations of non-target analytes. (Nitrogen, Nitrate (As N),Nitrogen, Nitrite (As N))

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Work Order: HS18100548

CASE NARRATIVE

WetChemistry by Method SW9056

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16TB02-181010
Collection Date: 10-Oct-2018 08:30

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-01
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 15:40
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 15:40
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 15:40
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 15:40
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 15:40
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 15:40
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 15:40
Surr: 1,2-Dichloroethane-d4	*88.5*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 15:40*
Surr: 4-Bromofluorobenzene	*97.5*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 15:40*
Surr: Dibromofluoromethane	*97.1*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 15:40*
Surr: Toluene-d8	*93.7*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 15:40*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW38-181010
Collection Date: 10-Oct-2018 09:49

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	19-Oct-2018 16:52
1,1-Dichloroethene	**21**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 16:52
1,2-Dibromoethane	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 16:52
cis-1,2-Dichloroethene	**240**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 16:52
Methylene chloride	10	U	10	10	20	ug/L	10	19-Oct-2018 16:52
Trichloroethene	**4,400**		**20**	**50**	**100**	**ug/L**	100	19-Oct-2018 17:20
Vinyl chloride	**160**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 16:52
Surr: 1,2-Dichloroethane-d4	*92.5*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 16:52*
Surr: 1,2-Dichloroethane-d4	*92.0*			**0**	*70-126*	*%REC*	*100*	*19-Oct-2018 17:20*
Surr: 4-Bromofluorobenzene	*98.9*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 16:52*
Surr: 4-Bromofluorobenzene	*98.0*			**0**	*81-113*	*%REC*	*100*	*19-Oct-2018 17:20*
Surr: Dibromofluoromethane	*96.8*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 16:52*
Surr: Dibromofluoromethane	*96.0*			**0**	*77-123*	*%REC*	*100*	*19-Oct-2018 17:20*
Surr: Toluene-d8	*90.6*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 16:52*
Surr: Toluene-d8	*91.3*			**0**	*82-127*	*%REC*	*100*	*19-Oct-2018 17:20*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW44-181010
Collection Date: 10-Oct-2018 10:05

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 17:42
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:42
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:42
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:42
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 17:42
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:42
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 17:42
Surr: 1,2-Dichloroethane-d4	*90.3*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 17:42*
Surr: 4-Bromofluorobenzene	*97.0*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 17:42*
Surr: Dibromofluoromethane	*95.2*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 17:42*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 17:42*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW33-181010
Collection Date: 10-Oct-2018 10:20

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 18:07
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:07
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:07
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:07
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 18:07
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:07
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:07
Surr: 1,2-Dichloroethane-d4	*89.0*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 18:07*
Surr: 4-Bromofluorobenzene	*98.1*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 18:07*
Surr: Dibromofluoromethane	*94.2*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 18:07*
Surr: Toluene-d8	*92.0*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 18:07*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW37-181010
Collection Date: 10-Oct-2018 10:39

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-05
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 18:31
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:31
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:31
cis-1,2-Dichloroethene	**5.2**		**0.20**	**0.50**	**1.0**	**ug/L**	1	18-Oct-2018 18:31
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 18:31
Trichloroethene	**84**		**0.20**	**0.50**	**1.0**	**ug/L**	1	18-Oct-2018 18:31
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:31
Surr: 1,2-Dichloroethane-d4	*89.9*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 18:31*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 18:31*
Surr: Dibromofluoromethane	*95.6*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 18:31*
Surr: Toluene-d8	*92.3*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 18:31*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW45-181010
Collection Date: 10-Oct-2018 11:10

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-06
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 18:56
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:56
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:56
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:56
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 18:56
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:56
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 18:56
Surr: 1,2-Dichloroethane-d4	*88.6*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 18:56*
Surr: 4-Bromofluorobenzene	*97.3*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 18:56*
Surr: Dibromofluoromethane	*96.6*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 18:56*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 18:56*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW14-181010
Collection Date: 10-Oct-2018 12:02

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-07
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 19:20
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:20
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:20
cis-1,2-Dichloroethene	**2.6**		**0.20**	**0.50**	**1.0**	**ug/L**	1	18-Oct-2018 19:20
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 19:20
Trichloroethene	**42**		**0.20**	**0.50**	**1.0**	**ug/L**	1	18-Oct-2018 19:20
Vinyl chloride	**1.1**		**0.20**	**0.50**	**1.0**	**ug/L**	1	18-Oct-2018 19:20
Surr: 1,2-Dichloroethane-d4	*90.8*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 19:20*
Surr: 4-Bromofluorobenzene	*97.4*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 19:20*
Surr: Dibromofluoromethane	*96.2*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 19:20*
Surr: Toluene-d8	*92.7*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 19:20*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW34-181010
Collection Date: 10-Oct-2018 13:05

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-08
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 19:45
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:45
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:45
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:45
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 19:45
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:45
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 19:45
Surr: 1,2-Dichloroethane-d4	*87.6*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 19:45*
Surr: 4-Bromofluorobenzene	*96.6*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 19:45*
Surr: Dibromofluoromethane	*95.3*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 19:45*
Surr: Toluene-d8	*93.8*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 19:45*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW35-181010
Collection Date: 10-Oct-2018 13:11

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-09
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	25	U	15	25	50	ug/L	50	19-Oct-2018 10:50
1,1-Dichloroethene	**190**		**10**	**25**	**50**	**ug/L**	50	19-Oct-2018 10:50
1,2-Dibromoethane	25	U	10	25	50	ug/L	50	19-Oct-2018 10:50
cis-1,2-Dichloroethene	**19,000**		**100**	**250**	**500**	**ug/L**	500	19-Oct-2018 11:17
Methylene chloride	50	U	50	50	100	ug/L	50	19-Oct-2018 10:50
Trichloroethene	**21,000**		**100**	**250**	**500**	**ug/L**	500	19-Oct-2018 11:17
Vinyl chloride	**170**		**10**	**25**	**50**	**ug/L**	50	19-Oct-2018 10:50
Surr: 1,2-Dichloroethane-d4	*94.4*			**0**	*70-126*	*%REC*	*50*	*19-Oct-2018 10:50*
Surr: 1,2-Dichloroethane-d4	*90.2*			**0**	*70-126*	*%REC*	*500*	*19-Oct-2018 11:17*
Surr: 4-Bromofluorobenzene	*98.0*			**0**	*81-113*	*%REC*	*50*	*19-Oct-2018 10:50*
Surr: 4-Bromofluorobenzene	*98.6*			**0**	*81-113*	*%REC*	*500*	*19-Oct-2018 11:17*
Surr: Dibromofluoromethane	*96.6*			**0**	*77-123*	*%REC*	*500*	*19-Oct-2018 11:17*
Surr: Dibromofluoromethane	*95.7*			**0**	*77-123*	*%REC*	*50*	*19-Oct-2018 10:50*
Surr: Toluene-d8	*91.4*			**0**	*82-127*	*%REC*	*50*	*19-Oct-2018 10:50*
Surr: Toluene-d8	*92.4*			**0**	*82-127*	*%REC*	*500*	*19-Oct-2018 11:17*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000644**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 13:37
Ethene	**0.00438**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 13:37
Methane	**0.0550**		**0.000214**	**0.00100**	**0.00100**	**mg/L**	2	18-Oct-2018 14:20
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**969**		**5.00**	**5.00**	**5.00**	**mg/L**	1	16-Oct-2018 14:19
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 21:36
Chloride	**699**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 21:50
Fluoride	**0.272**		**0.100**	**0.200**	**0.200**	**mg/L**	2	11-Oct-2018 21:36
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 21:36
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Oct-2018 21:36
Sulfate	**8,400**		**40.0**	**100**	**100**	**mg/L**	200	11-Oct-2018 22:05
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW16-181010
Collection Date: 10-Oct-2018 13:15

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-10
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	25	U	15	25	50	ug/L	50	19-Oct-2018 11:42
1,1-Dichloroethene	25	U	10	25	50	ug/L	50	19-Oct-2018 11:42
1,2-Dibromoethane	25	U	10	25	50	ug/L	50	19-Oct-2018 11:42
cis-1,2-Dichloroethene	**8,500**		**10**	**25**	**50**	**ug/L**	50	19-Oct-2018 11:42
Methylene chloride	50	U	50	50	100	ug/L	50	19-Oct-2018 11:42
Trichloroethene	**21,000**		**100**	**250**	**500**	**ug/L**	500	19-Oct-2018 12:08
Vinyl chloride	**330**		**10**	**25**	**50**	**ug/L**	50	19-Oct-2018 11:42
Surr: 1,2-Dichloroethane-d4	*91.8*			**0**	*70-126*	*%REC*	*50*	*19-Oct-2018 11:42*
Surr: 1,2-Dichloroethane-d4	*90.4*			**0**	*70-126*	*%REC*	*500*	*19-Oct-2018 12:08*
Surr: 4-Bromofluorobenzene	*97.1*			**0**	*81-113*	*%REC*	*50*	*19-Oct-2018 11:42*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*81-113*	*%REC*	*500*	*19-Oct-2018 12:08*
Surr: Dibromofluoromethane	*95.0*			**0**	*77-123*	*%REC*	*50*	*19-Oct-2018 11:42*
Surr: Dibromofluoromethane	*94.1*			**0**	*77-123*	*%REC*	*500*	*19-Oct-2018 12:08*
Surr: Toluene-d8	*90.1*			**0**	*82-127*	*%REC*	*50*	*19-Oct-2018 11:42*
Surr: Toluene-d8	*92.5*			**0**	*82-127*	*%REC*	*500*	*19-Oct-2018 12:08*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.00231**		**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 14:59
Ethene	**0.00498**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 14:59
Methane	**0.403**		**0.00214**	**0.0100**	**0.0100**	**mg/L**	20	18-Oct-2018 15:22
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**362**		**5.00**	**5.00**	**5.00**	**mg/L**	1	16-Oct-2018 14:25
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**4.69**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 22:19
Chloride	**1,100**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 22:34
Fluoride	**0.172**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 22:19
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 22:19
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 22:19
Sulfate	**722**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 22:34
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW31-181010
Collection Date: 10-Oct-2018 14:30

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-11
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	18-Oct-2018 16:05
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 16:05
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 16:05
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 16:05
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	18-Oct-2018 16:05
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 16:05
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	18-Oct-2018 16:05
Surr: 1,2-Dichloroethane-d4	*89.6*			**0**	*70-126*	*%REC*	*1*	*18-Oct-2018 16:05*
Surr: 4-Bromofluorobenzene	*98.0*			**0**	*81-113*	*%REC*	*1*	*18-Oct-2018 16:05*
Surr: Dibromofluoromethane	*96.3*			**0**	*77-123*	*%REC*	*1*	*18-Oct-2018 16:05*
Surr: Toluene-d8	*94.1*			**0**	*82-127*	*%REC*	*1*	*18-Oct-2018 16:05*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW31-181010-FD
Collection Date: 10-Oct-2018 14:30

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-12
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 06:16
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:16
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:16
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:16
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 06:16
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:16
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:16
Surr: 1,2-Dichloroethane-d4	*89.3*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 06:16*
Surr: 4-Bromofluorobenzene	*98.9*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 06:16*
Surr: Dibromofluoromethane	*97.7*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 06:16*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 06:16*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW22-181010
Collection Date: 10-Oct-2018 15:00

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-13
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 06:41
1,1-Dichloroethene	**1.9**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 06:41
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 06:41
cis-1,2-Dichloroethene	**19**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 06:41
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 06:41
Trichloroethene	**150**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 06:41
Vinyl chloride	**4.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 06:41
Surr: 1,2-Dichloroethane-d4	*92.8*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 06:41*
Surr: 4-Bromofluorobenzene	*98.2*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 06:41*
Surr: Dibromofluoromethane	*96.3*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 06:41*
Surr: Toluene-d8	*91.4*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 06:41*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	0.00100	U	0.000144	0.00100	0.00100	mg/L	1	18-Oct-2018 15:49
Ethene	**0.00156**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 15:49
Methane	**0.00246**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	18-Oct-2018 15:49
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**239**		**5.00**	**5.00**	**5.00**	**mg/L**	1	16-Oct-2018 14:47
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**4.46**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 22:48
Chloride	**997**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 23:03
Fluoride	**0.207**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	11-Oct-2018 22:48
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 22:48
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Oct-2018 22:48
Sulfate	**772**		**4.00**	**10.0**	**10.0**	**mg/L**	20	11-Oct-2018 23:03
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	22-Oct-2018 09:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
Sample ID: 16WW39-181010
Collection Date: 10-Oct-2018 15:39

ANALYTICAL REPORT
WorkOrder:HS18100548
Lab ID:HS18100548-14
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	19-Oct-2018 09:59
1,1-Dichloroethene	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 09:59
1,2-Dibromoethane	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 09:59
cis-1,2-Dichloroethene	**220**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 09:59
Methylene chloride	10	U	10	10	20	ug/L	10	19-Oct-2018 09:59
Trichloroethene	**3,900**		**20**	**50**	**100**	**ug/L**	100	19-Oct-2018 10:26
Vinyl chloride	**15**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 09:59
Surr: 1,2-Dichloroethane-d4	*89.3*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 09:59*
Surr: 1,2-Dichloroethane-d4	*91.3*			**0**	*70-126*	*%REC*	*100*	*19-Oct-2018 10:26*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 09:59*
Surr: 4-Bromofluorobenzene	*97.2*			**0**	*81-113*	*%REC*	*100*	*19-Oct-2018 10:26*
Surr: Dibromofluoromethane	*96.1*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 09:59*
Surr: Dibromofluoromethane	*96.5*			**0**	*77-123*	*%REC*	*100*	*19-Oct-2018 10:26*
Surr: Toluene-d8	*91.7*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 09:59*
Surr: Toluene-d8	*92.5*			**0**	*82-127*	*%REC*	*100*	*19-Oct-2018 10:26*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**4.20**		**0.0600**	**0.200**	**0.200**	**mg/L**	2	11-Oct-2018 23:17
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	26-Oct-2018 10:05

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325461 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			11 Oct 2018 22:05	200
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			11 Oct 2018 21:50	20
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			11 Oct 2018 21:36	2
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			11 Oct 2018 22:34	20
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			11 Oct 2018 22:19	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			11 Oct 2018 23:03	20
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			11 Oct 2018 22:48	1
HS18100548-14	16WW39-181010	10 Oct 2018 15:39			11 Oct 2018 23:17	2
Batch ID: R325562 (0)	**Test Name :** ALKALINITY BY SM2320B				**Matrix:** Groundwater	
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			16 Oct 2018 14:19	1
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			16 Oct 2018 14:25	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			16 Oct 2018 14:47	1
Batch ID: R325736 (0)	**Test Name :** DISSOLVED GASES BY RSK-175				**Matrix:** Groundwater	
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			18 Oct 2018 14:20	2
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			18 Oct 2018 13:37	1
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			18 Oct 2018 15:22	20
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			18 Oct 2018 14:59	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			18 Oct 2018 15:49	1
Batch ID: R325746 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18100548-03	16WW44-181010	10 Oct 2018 10:05			18 Oct 2018 17:42	1
HS18100548-04	16WW33-181010	10 Oct 2018 10:20			18 Oct 2018 18:07	1
HS18100548-05	16WW37-181010	10 Oct 2018 10:39			18 Oct 2018 18:31	1
HS18100548-06	16WW45-181010	10 Oct 2018 11:10			18 Oct 2018 18:56	1
HS18100548-07	16WW14-181010	10 Oct 2018 12:02			18 Oct 2018 19:20	1
HS18100548-08	16WW34-181010	10 Oct 2018 13:05			18 Oct 2018 19:45	1
HS18100548-11	16WW31-181010	10 Oct 2018 14:30			18 Oct 2018 16:05	1
Batch ID: R325746 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Water	
HS18100548-01	16TB02-181010	10 Oct 2018 08:30			18 Oct 2018 15:40	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			19 Oct 2018 11:17	500
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			19 Oct 2018 10:50	50
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			19 Oct 2018 12:08	500
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			19 Oct 2018 11:42	50
HS18100548-12	16WW31-181010-FD	10 Oct 2018 14:30			19 Oct 2018 06:16	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			19 Oct 2018 06:41	1
HS18100548-14	16WW39-181010	10 Oct 2018 15:39			19 Oct 2018 10:26	100
HS18100548-14	16WW39-181010	10 Oct 2018 15:39			19 Oct 2018 09:59	10

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325826 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18100548-02	16WW38-181010	10 Oct 2018 09:49			19 Oct 2018 17:20	100
HS18100548-02	16WW38-181010	10 Oct 2018 09:49			19 Oct 2018 16:52	10
Batch ID: R325853 (0)	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			22 Oct 2018 09:40	1
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			22 Oct 2018 09:40	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			22 Oct 2018 09:40	1
Batch ID: R326185 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Groundwater	
HS18100548-02	16WW38-181010	10 Oct 2018 09:49			26 Oct 2018 10:05	1
HS18100548-03	16WW44-181010	10 Oct 2018 10:05			26 Oct 2018 10:05	1
HS18100548-04	16WW33-181010	10 Oct 2018 10:20			26 Oct 2018 10:05	1
HS18100548-05	16WW37-181010	10 Oct 2018 10:39			26 Oct 2018 10:05	1
HS18100548-06	16WW45-181010	10 Oct 2018 11:10			26 Oct 2018 10:05	1
HS18100548-07	16WW14-181010	10 Oct 2018 12:02			26 Oct 2018 10:05	1
HS18100548-08	16WW34-181010	10 Oct 2018 13:05			26 Oct 2018 10:05	1
HS18100548-09	16WW35-181010	10 Oct 2018 13:11			26 Oct 2018 10:05	1
HS18100548-10	16WW16-181010	10 Oct 2018 13:15			26 Oct 2018 10:05	1
HS18100548-11	16WW31-181010	10 Oct 2018 14:30			26 Oct 2018 10:05	1
HS18100548-12	16WW31-181010-FD	10 Oct 2018 14:30			26 Oct 2018 10:05	1
HS18100548-13	16WW22-181010	10 Oct 2018 15:00			26 Oct 2018 10:05	1
HS18100548-14	16WW39-181010	10 Oct 2018 15:39			26 Oct 2018 10:05	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325736 (0) **Instrument:** FID-4 **Method:** DISSOLVED GASES BY RSK-175

MBLK Sample ID: **MBLK-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 13:19**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784197** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.00100	0.00100								U
Ethene	0.00100	0.00100								U
Methane	0.000500	0.000500								U

LCS Sample ID: **LCS-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 12:58**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784195** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0167	0.00100	0.01804	0	92.5	75 - 125				
Ethene	0.0158	0.00100	0.0168	0	93.9	75 - 125				
Methane	0.00883	0.000500	0.009647	0	91.5	75 - 125				

LCSD Sample ID: **LCSD-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 13:09**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784196** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0171	0.00100	0.01804	0	94.7	75 - 125	0.01668	2.36	30	
Ethene	0.0164	0.00100	0.0168	0	97.4	75 - 125	0.01577	3.66	30	
Methane	0.00805	0.000500	0.009647	0	83.4	75 - 125	0.008831	9.29	30	

MS Sample ID: **HS18100713-02MS** Units: **mg/L** Analysis Date: **18-Oct-2018 16:40**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784204** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0220	0.00100	0.01804	0.0004656	119	75 - 125				
Ethene	0.0255	0.00100	0.0168	0.002499	137	75 - 125				S
Methane	0.0294	0.000500	0.009647	0.01297	170	75 - 125				S

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325736 (0)** **Instrument:** **FID-4** **Method:** **DISSOLVED GASES BY RSK-175**

MSD Sample ID: **HS18100713-02MSD** Units: **mg/L** Analysis Date: **18-Oct-2018 17:05**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784205** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0213	0.00100	0.01804	0.0004656	116	75 - 125	0.02200	3.2	30	
Ethene	0.0238	0.00100	0.0168	0.002499	127	75 - 125	0.02546	6.57	30	S
Methane	0.0332	0.000500	0.009647	0.01297	210	75 - 125	0.02937	12.3	30	S

The following samples were analyzed in this batch: HS18100548-09 HS18100548-10 HS18100548-13

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** 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	*43.36*	*1.0*	*50*	*0*	*86.7*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.8*	*1.0*	*50*	*0*	*97.6*	*82 - 115*				
Surr: Dibromofluoromethane	*48.22*	*1.0*	*50*	*0*	*96.4*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 15:16**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779648** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.49*	*1.0*	*50*	*0*	*93.0*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** 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	20.53	1.0	20	0	103	77 - 118				
1,1,1-Trichloroethane	18.86	1.0	20	0	94.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.63	1.0	20	0	83.2	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.18	1.0	20	0	106	70 - 130				
1,1,2-Trichloroethane	19.93	1.0	20	0	99.7	77 - 113				
1,1-Dichloroethane	19.8	1.0	20	0	99.0	71 - 122				
1,1-Dichloroethene	19.33	1.0	20	0	96.6	70 - 130				
1,1-Dichloropropene	21.51	1.0	20	0	108	78 - 118				
1,2,3-Trichlorobenzene	17.37	1.0	20	0	86.8	70 - 130				
1,2,3-Trichloropropane	16.89	1.0	20	0	84.5	70 - 127				
1,2,4-Trichlorobenzene	18.68	1.0	20	0	93.4	77 - 126				
1,2,4-Trimethylbenzene	21.51	1.0	20	0	108	73 - 121				
1,2-Dibromo-3-chloropropane	14.83	1.0	20	0	74.1	70 - 130				
1,2-Dibromoethane	20.01	1.0	20	0	100	76 - 123				
1,2-Dichlorobenzene	19.65	1.0	20	0	98.2	77 - 113				
1,2-Dichloroethane	19.51	1.0	20	0	97.5	70 - 124				
1,2-Dichloropropane	21.49	1.0	20	0	107	72 - 119				
1,3,5-Trimethylbenzene	19.75	1.0	20	0	98.7	75 - 118				
1,3-Dichlorobenzene	19.83	1.0	20	0	99.1	78 - 118				
1,3-Dichloropropane	20	1.0	20	0	100.0	75 - 116				
1,4-Dichlorobenzene	20.55	1.0	20	0	103	79 - 113				
2,2-Dichloropropane	22.17	1.0	20	0	111	70 - 130				
2-Butanone	32.82	2.0	40	0	82.0	70 - 130				
2-Chlorotoluene	21.38	1.0	20	0	107	70 - 128				
2-Hexanone	33.25	2.0	40	0	83.1	70 - 130				
4-Chlorotoluene	21.73	1.0	20	0	109	74 - 126				
4-Isopropyltoluene	19	1.0	20	0	95.0	74 - 126				
4-Methyl-2-pentanone	34.53	2.0	40	0	86.3	70 - 130				
Acetone	32.89	2.0	40	0	82.2	70 - 130				
Benzene	20.78	1.0	20	0	104	74 - 120				
Bromobenzene	19.94	1.0	20	0	99.7	78 - 113				
Bromochloromethane	20.73	1.0	20	0	104	76 - 124				
Bromodichloromethane	20.89	1.0	20	0	104	74 - 122				
Bromoform	19.09	1.0	20	0	95.5	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	25.23	1.0	20	0	126	70 - 130				
Carbon disulfide	38.37	2.0	40	0	95.9	70 - 130				
Carbon tetrachloride	21.25	1.0	20	0	106	71 - 125				
Chlorobenzene	20.82	1.0	20	0	104	76 - 113				
Chloroethane	20.03	1.0	20	0	100	70 - 130				
Chloroform	19.22	1.0	20	0	96.1	71 - 121				
Chloromethane	18.25	1.0	20	0	91.2	70 - 129				
cis-1,2-Dichloroethene	20.34	1.0	20	0	102	75 - 122				
cis-1,3-Dichloropropene	22.11	1.0	20	0	111	73 - 127				
Dibromochloromethane	19.77	1.0	20	0	98.9	77 - 122				
Dibromomethane	20.5	1.0	20	0	102	78 - 121				
Dichlorodifluoromethane	14.82	1.0	20	0	74.1	70 - 130				
Ethylbenzene	22.7	1.0	20	0	114	77 - 117				
Hexachlorobutadiene	20.48	1.0	20	0	102	70 - 130				
Isopropylbenzene	20.48	1.0	20	0	102	73 - 127				
m,p-Xylene	46.4	2.0	40	0	116	77 - 122				
Methylene chloride	20.02	2.0	20	0	100	70 - 127				
Naphthalene	15.31	1.0	20	0	76.5	70 - 130				
n-Butylbenzene	20.82	1.0	20	0	104	72 - 130				
n-Propylbenzene	22.11	1.0	20	0	111	73 - 124				
o-Xylene	22.33	1.0	20	0	112	75 - 119				
sec-Butylbenzene	19.32	1.0	20	0	96.6	73 - 128				
Styrene	21.17	1.0	20	0	106	72 - 126				
tert-Butylbenzene	21.25	1.0	20	0	106	73 - 124				
Tetrachloroethene	20.36	1.0	20	0	102	76 - 119				
Toluene	20.46	1.0	20	0	102	77 - 118				
trans-1,2-Dichloroethene	20.52	1.0	20	0	103	72 - 127				
trans-1,3-Dichloropropene	22.37	1.0	20	0	112	77 - 119				
Trichloroethene	21.27	1.0	20	0	106	77 - 121				
Trichlorofluoromethane	20.65	1.0	20	0	103	70 - 130				
Vinyl chloride	19.94	1.0	20	0	99.7	70 - 130				
Surr: 1,2-Dichloroethane-d4	*45.03*	*1.0*	*50*	*0*	*90.1*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.78*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.4*	*1.0*	*50*	*0*	*94.8*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **18-Oct-2018 14:27**
Client ID: Run ID: **VOA2_325746** SeqNo: **4779646** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.21*	*1.0*	*50*	*0*	*90.4*	*81 - 120*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779651** 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	19.9	1.0	20	0	99.5	70 - 120				
1,1,1-Trichloroethane	19.85	1.0	20	0	99.2	70 - 130				
1,1,2,2-Tetrachloroethane	16.75	1.0	20	0	83.8	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	23.06	1.0	20	0	115	70 - 130				
1,1,2-Trichloroethane	19.23	1.0	20	0	96.2	70 - 117				
1,1-Dichloroethane	20.23	1.0	20	0	101	70 - 127				
1,1-Dichloroethene	21.12	1.0	20	0	106	70 - 130				
1,1-Dichloropropene	22.98	1.0	20	0	115	70 - 129				
1,2,3-Trichlorobenzene	16.79	1.0	20	0	84.0	70 - 130				
1,2,3-Trichloropropane	17.04	1.0	20	0	85.2	70 - 130				
1,2,4-Trichlorobenzene	18.35	1.0	20	0	91.7	70 - 125				
1,2,4-Trimethylbenzene	20.2	1.0	20	0	101	70 - 125				
1,2-Dibromo-3-chloropropane	15.11	1.0	20	0	75.5	70 - 130				
1,2-Dibromoethane	20.23	1.0	20	0	101	70 - 124				
1,2-Dichlorobenzene	18.84	1.0	20	0	94.2	70 - 115				
1,2-Dichloroethane	19.51	1.0	20	0	97.5	70 - 127				
1,2-Dichloropropane	20.81	1.0	20	0	104	70 - 122				
1,3,5-Trimethylbenzene	18.84	1.0	20	0	94.2	70 - 126				
1,3-Dichlorobenzene	19.38	1.0	20	0	96.9	70 - 119				
1,3-Dichloropropane	19.78	1.0	20	0	98.9	70 - 121				
1,4-Dichlorobenzene	20.14	1.0	20	0	101	70 - 114				
2,2-Dichloropropane	24.13	1.0	20	0	121	70 - 130				
2-Butanone	36.01	2.0	40	0	90.0	70 - 130				
2-Chlorotoluene	20.76	1.0	20	0	104	70 - 130				
2-Hexanone	35.65	2.0	40	0	89.1	70 - 130				
4-Chlorotoluene	21.04	1.0	20	0	105	70 - 130				
4-Isopropyltoluene	18.65	1.0	20	0	93.3	70 - 130				
4-Methyl-2-pentanone	35.73	2.0	40	0	89.3	70 - 130				
Acetone	33.5	2.0	40	0	83.8	70 - 130				
Benzene	20.4	1.0	20	0	102	70 - 127				
Bromobenzene	19.03	1.0	20	0	95.1	70 - 115				
Bromochloromethane	20.07	1.0	20	0	100	70 - 127				
Bromodichloromethane	20.4	1.0	20	0	102	70 - 124				
Bromoform	18.89	1.0	20	0	94.5	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779651** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.14	1.0	20	0	121	70 - 130				
Carbon disulfide	40.53	2.0	40	0	101	70 - 130				
Carbon tetrachloride	21.38	1.0	20	0	107	70 - 130				
Chlorobenzene	20.81	1.0	20	0	104	70 - 114				
Chloroethane	20.23	1.0	20	0	101	70 - 130				
Chloroform	19.57	1.0	20	0	97.8	70 - 125				
Chloromethane	17.45	1.0	20	0	87.2	70 - 130				
cis-1,2-Dichloroethene	20.83	1.0	20	0	104	70 - 128				
cis-1,3-Dichloropropene	22.19	1.0	20	0	111	70 - 125				
Dibromochloromethane	19.34	1.0	20	0	96.7	70 - 124				
Dibromomethane	19.74	1.0	20	0	98.7	70 - 124				
Dichlorodifluoromethane	15.84	1.0	20	0	79.2	70 - 130				
Ethylbenzene	22.34	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	19.43	1.0	20	0	97.2	70 - 130				
Isopropylbenzene	20.2	1.0	20	0	101	70 - 130				
m,p-Xylene	45.94	2.0	40	0	115	70 - 130				
Methylene chloride	19.93	2.0	20	0	99.7	70 - 128				
Naphthalene	15.61	1.0	20	0	78.1	70 - 130				
n-Butylbenzene	20.82	1.0	20	0	104	70 - 130				
n-Propylbenzene	21.93	1.0	20	0	110	70 - 130				
o-Xylene	22.17	1.0	20	0	111	70 - 124				
sec-Butylbenzene	18.87	1.0	20	0	94.4	70 - 130				
Styrene	20.53	1.0	20	0	103	70 - 130				
tert-Butylbenzene	20.84	1.0	20	0	104	70 - 130				
Tetrachloroethene	20.61	1.0	20	0	103	70 - 130				
Toluene	20.26	1.0	20	0	101	70 - 123				
trans-1,2-Dichloroethene	21.62	1.0	20	0	108	70 - 130				
trans-1,3-Dichloropropene	22.47	1.0	20	0	112	70 - 121				
Trichloroethene	21.67	1.0	20	0	108	70 - 129				
Trichlorofluoromethane	21.58	1.0	20	0	108	70 - 130				
Vinyl chloride	20.35	1.0	20	0	102	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.9*	*1.0*	*50*	*0*	*93.8*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.07*	*1.0*	*50*	*0*	*100*	*81 - 113*				
Surr: Dibromofluoromethane	*47.92*	*1.0*	*50*	*0*	*95.8*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100548-11MS** Units: **ug/L** Analysis Date: **18-Oct-2018 16:29**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779651** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.76*	*1.0*	*50*	*0*	*89.5*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779652** 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	70 - 120	19.9	1.5	20	
1,1,1-Trichloroethane	19.2	1.0	20	0	96.0	70 - 130	19.85	3.32	20	
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123	16.75	0.827	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	22.8	1.0	20	0	114	70 - 130	23.06	1.15	20	
1,1,2-Trichloroethane	19.9	1.0	20	0	99.5	70 - 117	19.23	3.42	20	
1,1-Dichloroethane	20.03	1.0	20	0	100	70 - 127	20.23	0.952	20	
1,1-Dichloroethene	19.86	1.0	20	0	99.3	70 - 130	21.12	6.18	20	
1,1-Dichloropropene	21.75	1.0	20	0	109	70 - 129	22.98	5.5	20	
1,2,3-Trichlorobenzene	17.13	1.0	20	0	85.6	70 - 130	16.79	1.97	20	
1,2,3-Trichloropropane	16.97	1.0	20	0	84.9	70 - 130	17.04	0.369	20	
1,2,4-Trichlorobenzene	18.81	1.0	20	0	94.0	70 - 125	18.35	2.46	20	
1,2,4-Trimethylbenzene	20.52	1.0	20	0	103	70 - 125	20.2	1.57	20	
1,2-Dibromo-3-chloropropane	15.33	1.0	20	0	76.6	70 - 130	15.11	1.44	20	
1,2-Dibromoethane	20.16	1.0	20	0	101	70 - 124	20.23	0.37	20	
1,2-Dichlorobenzene	19.28	1.0	20	0	96.4	70 - 115	18.84	2.29	20	
1,2-Dichloroethane	20.92	1.0	20	0	105	70 - 127	19.51	7.02	20	
1,2-Dichloropropane	20.94	1.0	20	0	105	70 - 122	20.81	0.596	20	
1,3,5-Trimethylbenzene	18.98	1.0	20	0	94.9	70 - 126	18.84	0.721	20	
1,3-Dichlorobenzene	19.63	1.0	20	0	98.2	70 - 119	19.38	1.28	20	
1,3-Dichloropropane	20.12	1.0	20	0	101	70 - 121	19.78	1.7	20	
1,4-Dichlorobenzene	20.06	1.0	20	0	100	70 - 114	20.14	0.375	20	
2,2-Dichloropropane	23.11	1.0	20	0	116	70 - 130	24.13	4.33	20	
2-Butanone	34.47	2.0	40	0	86.2	70 - 130	36.01	4.36	20	
2-Chlorotoluene	21.04	1.0	20	0	105	70 - 130	20.76	1.33	20	
2-Hexanone	35.39	2.0	40	0	88.5	70 - 130	35.65	0.739	20	
4-Chlorotoluene	21.03	1.0	20	0	105	70 - 130	21.04	0.0438	20	
4-Isopropyltoluene	18.45	1.0	20	0	92.3	70 - 130	18.65	1.06	20	
4-Methyl-2-pentanone	36.16	2.0	40	0	90.4	70 - 130	35.73	1.22	20	
Acetone	30.54	2.0	40	0	76.3	70 - 130	33.5	9.26	20	
Benzene	20.35	1.0	20	0	102	70 - 127	20.4	0.246	20	
Bromobenzene	19.19	1.0	20	0	96.0	70 - 115	19.03	0.872	20	
Bromochloromethane	20.28	1.0	20	0	101	70 - 127	20.07	1.03	20	
Bromodichloromethane	20.64	1.0	20	0	103	70 - 124	20.4	1.2	20	
Bromoform	18.83	1.0	20	0	94.1	70 - 129	18.89	0.357	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325746 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779652** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	22.95	1.0	20	0	115	70 - 130	24.14	5.05	20	
Carbon disulfide	39.61	2.0	40	0	99.0	70 - 130	40.53	2.28	20	
Carbon tetrachloride	20.83	1.0	20	0	104	70 - 130	21.38	2.61	20	
Chlorobenzene	21.12	1.0	20	0	106	70 - 114	20.81	1.47	20	
Chloroethane	18.88	1.0	20	0	94.4	70 - 130	20.23	6.88	20	
Chloroform	19.61	1.0	20	0	98.0	70 - 125	19.57	0.197	20	
Chloromethane	16.16	1.0	20	0	80.8	70 - 130	17.45	7.66	20	
cis-1,2-Dichloroethene	20.13	1.0	20	0	101	70 - 128	20.83	3.39	20	
cis-1,3-Dichloropropene	21.94	1.0	20	0	110	70 - 125	22.19	1.12	20	
Dibromochloromethane	19.44	1.0	20	0	97.2	70 - 124	19.34	0.484	20	
Dibromomethane	20.65	1.0	20	0	103	70 - 124	19.74	4.48	20	
Dichlorodifluoromethane	14.38	1.0	20	0	71.9	70 - 130	15.84	9.68	20	
Ethylbenzene	22.5	1.0	20	0	113	70 - 124	22.34	0.717	20	
Hexachlorobutadiene	19.41	1.0	20	0	97.0	70 - 130	19.43	0.114	20	
Isopropylbenzene	20.13	1.0	20	0	101	70 - 130	20.2	0.341	20	
m,p-Xylene	46.12	2.0	40	0	115	70 - 130	45.94	0.383	20	
Methylene chloride	20.76	2.0	20	0	104	70 - 128	19.93	4.07	20	
Naphthalene	15.84	1.0	20	0	79.2	70 - 130	15.61	1.43	20	
n-Butylbenzene	20.53	1.0	20	0	103	70 - 130	20.82	1.37	20	
n-Propylbenzene	21.64	1.0	20	0	108	70 - 130	21.93	1.32	20	
o-Xylene	22.18	1.0	20	0	111	70 - 124	22.17	0.0606	20	
sec-Butylbenzene	18.67	1.0	20	0	93.3	70 - 130	18.87	1.11	20	
Styrene	20.71	1.0	20	0	104	70 - 130	20.53	0.897	20	
tert-Butylbenzene	20.77	1.0	20	0	104	70 - 130	20.84	0.363	20	
Tetrachloroethene	20.55	1.0	20	0	103	70 - 130	20.61	0.29	20	
Toluene	20.33	1.0	20	0	102	70 - 123	20.26	0.353	20	
trans-1,2-Dichloroethene	21.28	1.0	20	0	106	70 - 130	21.62	1.59	20	
trans-1,3-Dichloropropene	21.79	1.0	20	0	109	70 - 121	22.47	3.08	20	
Trichloroethene	20.97	1.0	20	0	105	70 - 129	21.67	3.27	20	
Trichlorofluoromethane	20.34	1.0	20	0	102	70 - 130	21.58	5.94	20	
Vinyl chloride	19.17	1.0	20	0	95.9	70 - 130	20.35	5.96	20	
Surr: 1,2-Dichloroethane-d4	*45.87*	*1.0*	*50*	*0*	*91.7*	*70 - 126*	*46.9*	*2.21*	*20*	
Surr: 4-Bromofluorobenzene	*50.49*	*1.0*	*50*	*0*	*101*	*81 - 113*	*50.07*	*0.838*	*20*	
Surr: Dibromofluoromethane	*47.6*	*1.0*	*50*	*0*	*95.2*	*77 - 123*	*47.92*	*0.666*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325746 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100548-11MSD** Units: **ug/L** Analysis Date: **18-Oct-2018 16:54**
Client ID: **16WW31-181010** Run ID: **VOA2_325746** SeqNo: **4779652** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.91*	*1.0*	*50*	*0*	*89.8*	*82 - 127*	*44.76*	*0.336*	*20*	

The following samples were analyzed in this batch:

HS18100548-01	HS18100548-03	HS18100548-04	HS18100548-05
HS18100548-06	HS18100548-07	HS18100548-08	HS18100548-11

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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	*44.77*	*1.0*	*50*	*0*	*89.5*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.49*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*48.4*	*1.0*	*50*	*0*	*96.8*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.29*	*1.0*	*50*	*0*	*92.6*	*81 - 120*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** 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	21.9	1.0	20	0	110	77 - 118				
1,1,1-Trichloroethane	20.17	1.0	20	0	101	70 - 130				
1,1,2,2-Tetrachloroethane	18.73	1.0	20	0	93.7	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.13	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.59	1.0	20	0	108	77 - 113				
1,1-Dichloroethane	20.69	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.65	1.0	20	0	103	70 - 130				
1,1-Dichloropropene	22.03	1.0	20	0	110	78 - 118				
1,2,3-Trichlorobenzene	20.23	1.0	20	0	101	70 - 130				
1,2,3-Trichloropropane	18.8	1.0	20	0	94.0	70 - 127				
1,2,4-Trichlorobenzene	21.62	1.0	20	0	108	77 - 126				
1,2,4-Trimethylbenzene	22.46	1.0	20	0	112	73 - 121				
1,2-Dibromo-3-chloropropane	17.54	1.0	20	0	87.7	70 - 130				
1,2-Dibromoethane	22.39	1.0	20	0	112	76 - 123				
1,2-Dichlorobenzene	21.11	1.0	20	0	106	77 - 113				
1,2-Dichloroethane	22.56	1.0	20	0	113	70 - 124				
1,2-Dichloropropane	22.14	1.0	20	0	111	72 - 119				
1,3,5-Trimethylbenzene	19.98	1.0	20	0	99.9	75 - 118				
1,3-Dichlorobenzene	20.97	1.0	20	0	105	78 - 118				
1,3-Dichloropropane	21.84	1.0	20	0	109	75 - 116				
1,4-Dichlorobenzene	21.68	1.0	20	0	108	79 - 113				
2,2-Dichloropropane	22.14	1.0	20	0	111	70 - 130				
2-Butanone	39.81	2.0	40	0	99.5	70 - 130				
2-Chlorotoluene	22.93	1.0	20	0	115	70 - 128				
2-Hexanone	39.54	2.0	40	0	98.9	70 - 130				
4-Chlorotoluene	22.78	1.0	20	0	114	74 - 126				
4-Isopropyltoluene	19.4	1.0	20	0	97.0	74 - 126				
4-Methyl-2-pentanone	40.5	2.0	40	0	101	70 - 130				
Acetone	40.41	2.0	40	0	101	70 - 130				
Benzene	21.64	1.0	20	0	108	74 - 120				
Bromobenzene	20.92	1.0	20	0	105	78 - 113				
Bromochloromethane	22.15	1.0	20	0	111	76 - 124				
Bromodichloromethane	22.39	1.0	20	0	112	74 - 122				
Bromoform	21.3	1.0	20	0	107	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.16	1.0	20	0	121	70 - 130				
Carbon disulfide	40.05	2.0	40	0	100	70 - 130				
Carbon tetrachloride	21.81	1.0	20	0	109	71 - 125				
Chlorobenzene	22.48	1.0	20	0	112	76 - 113				
Chloroethane	18.82	1.0	20	0	94.1	70 - 130				
Chloroform	20.57	1.0	20	0	103	71 - 121				
Chloromethane	18.22	1.0	20	0	91.1	70 - 129				
cis-1,2-Dichloroethene	21.8	1.0	20	0	109	75 - 122				
cis-1,3-Dichloropropene	23.68	1.0	20	0	118	73 - 127				
Dibromochloromethane	21.85	1.0	20	0	109	77 - 122				
Dibromomethane	22.8	1.0	20	0	114	78 - 121				
Dichlorodifluoromethane	16.02	1.0	20	0	80.1	70 - 130				
Ethylbenzene	23.45	1.0	20	0	117	77 - 117				S
Hexachlorobutadiene	20.75	1.0	20	0	104	70 - 130				
Isopropylbenzene	21.35	1.0	20	0	107	73 - 127				
m,p-Xylene	48.78	2.0	40	0	122	77 - 122				
Methylene chloride	21.65	2.0	20	0	108	70 - 127				
Naphthalene	19.4	1.0	20	0	97.0	70 - 130				
n-Butylbenzene	21.53	1.0	20	0	108	72 - 130				
n-Propylbenzene	22.93	1.0	20	0	115	73 - 124				
o-Xylene	23.76	1.0	20	0	119	75 - 119				
sec-Butylbenzene	19.62	1.0	20	0	98.1	73 - 128				
Styrene	22.74	1.0	20	0	114	72 - 126				
tert-Butylbenzene	22.15	1.0	20	0	111	73 - 124				
Tetrachloroethene	21.25	1.0	20	0	106	76 - 119				
Toluene	21.16	1.0	20	0	106	77 - 118				
trans-1,2-Dichloroethene	22.17	1.0	20	0	111	72 - 127				
trans-1,3-Dichloropropene	23.72	1.0	20	0	119	77 - 119				
Trichloroethene	23.1	1.0	20	0	115	77 - 121				
Trichlorofluoromethane	20.46	1.0	20	0	102	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.15*	*1.0*	*50*	*0*	*92.3*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.86*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.17*	*1.0*	*50*	*0*	*94.3*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.26*	*1.0*	*50*	*0*	*90.5*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** 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	19.93	1.0	20	0	99.6	70 - 120				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.64	1.0	20	0	108	70 - 130				
1,1,2-Trichloroethane	19.52	1.0	20	0	97.6	70 - 117				
1,1-Dichloroethane	19.44	1.0	20	0	97.2	70 - 127				
1,1-Dichloroethene	20.24	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	22.55	1.0	20	0	113	70 - 129				
1,2,3-Trichlorobenzene	16.48	1.0	20	0	82.4	70 - 130				
1,2,3-Trichloropropane	16.73	1.0	20	0	83.6	70 - 130				
1,2,4-Trichlorobenzene	17.65	1.0	20	0	88.3	70 - 125				
1,2,4-Trimethylbenzene	19.83	1.0	20	0	99.2	70 - 125				
1,2-Dibromo-3-chloropropane	14.87	1.0	20	0	74.4	70 - 130				
1,2-Dibromoethane	19.89	1.0	20	0	99.5	70 - 124				
1,2-Dichlorobenzene	18.74	1.0	20	0	93.7	70 - 115				
1,2-Dichloroethane	19.14	1.0	20	0	95.7	70 - 127				
1,2-Dichloropropane	20.52	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	18.38	1.0	20	0	91.9	70 - 126				
1,3-Dichlorobenzene	18.85	1.0	20	0	94.2	70 - 119				
1,3-Dichloropropane	19.64	1.0	20	0	98.2	70 - 121				
1,4-Dichlorobenzene	19.01	1.0	20	0	95.1	70 - 114				
2,2-Dichloropropane	20.09	1.0	20	0	100	70 - 130				
2-Butanone	34.38	2.0	40	0	86.0	70 - 130				
2-Chlorotoluene	20.71	1.0	20	0	104	70 - 130				
2-Hexanone	34.15	2.0	40	0	85.4	70 - 130				
4-Chlorotoluene	20.55	1.0	20	0	103	70 - 130				
4-Isopropyltoluene	17.83	1.0	20	0	89.2	70 - 130				
4-Methyl-2-pentanone	36.27	2.0	40	0	90.7	70 - 130				
Acetone	35.8	2.0	40	0	89.5	70 - 130				
Benzene	20.48	1.0	20	0	102	70 - 127				
Bromobenzene	19.06	1.0	20	0	95.3	70 - 115				
Bromochloromethane	19.62	1.0	20	0	98.1	70 - 127				
Bromodichloromethane	20.37	1.0	20	0	102	70 - 124				
Bromoform	18.57	1.0	20	0	92.9	70 - 129				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.12	1.0	20	0	116	70 - 130				
Carbon disulfide	39.49	2.0	40	0	98.7	70 - 130				
Carbon tetrachloride	21.31	1.0	20	0	107	70 - 130				
Chlorobenzene	20.51	1.0	20	0	103	70 - 114				
Chloroethane	19.96	1.0	20	0	99.8	70 - 130				
Chloroform	18.95	1.0	20	0	94.7	70 - 125				
Chloromethane	16.31	1.0	20	0	81.5	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	21.1	1.0	20	0	106	70 - 125				
Dibromochloromethane	19.32	1.0	20	0	96.6	70 - 124				
Dibromomethane	20.47	1.0	20	0	102	70 - 124				
Dichlorodifluoromethane	16.46	1.0	20	0	82.3	70 - 130				
Ethylbenzene	22.32	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	18.59	1.0	20	0	92.9	70 - 130				
Isopropylbenzene	19.83	1.0	20	0	99.2	70 - 130				
m,p-Xylene	44.08	2.0	40	0	110	70 - 130				
Methylene chloride	19.79	2.0	20	0	99.0	70 - 128				
Naphthalene	14.85	1.0	20	0	74.2	70 - 130				
n-Butylbenzene	19.62	1.0	20	0	98.1	70 - 130				
n-Propylbenzene	21.13	1.0	20	0	106	70 - 130				
o-Xylene	21.69	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.74	1.0	20	0	93.7	70 - 130				
Styrene	19.72	1.0	20	0	98.6	70 - 130				
tert-Butylbenzene	20.67	1.0	20	0	103	70 - 130				
Tetrachloroethene	20.42	1.0	20	0	102	70 - 130				
Toluene	20.05	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	20.57	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	21.52	1.0	20	0	108	70 - 121				
Trichloroethene	21.28	1.0	20	0	106	70 - 129				
Trichlorofluoromethane	21.09	1.0	20	0	105	70 - 130				
Vinyl chloride	20.12	1.0	20	0	101	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.12*	*1.0*	*50*	*0*	*94.2*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.83*	*1.0*	*50*	*0*	*104*	*81 - 113*				
Surr: Dibromofluoromethane	*47.28*	*1.0*	*50*	*0*	*94.6*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** 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	19.67	1.0	20	0	98.3	70 - 120	19.93	1.3	20	
1,1,1-Trichloroethane	18.24	1.0	20	0	91.2	70 - 130	19.47	6.49	20	
1,1,2,2-Tetrachloroethane	15.89	1.0	20	0	79.5	70 - 123	16.62	4.49	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	19.82	1.0	20	0	99.1	70 - 130	21.64	8.76	20	
1,1,2-Trichloroethane	19.13	1.0	20	0	95.7	70 - 117	19.52	2	20	
1,1-Dichloroethane	18.24	1.0	20	0	91.2	70 - 127	19.44	6.36	20	
1,1-Dichloroethene	18.81	1.0	20	0	94.0	70 - 130	20.24	7.34	20	
1,1-Dichloropropene	20.91	1.0	20	0	105	70 - 129	22.55	7.55	20	
1,2,3-Trichlorobenzene	16.77	1.0	20	0	83.8	70 - 130	16.48	1.73	20	
1,2,3-Trichloropropane	16.43	1.0	20	0	82.1	70 - 130	16.73	1.82	20	
1,2,4-Trichlorobenzene	17.98	1.0	20	0	89.9	70 - 125	17.65	1.85	20	
1,2,4-Trimethylbenzene	19.53	1.0	20	0	97.7	70 - 125	19.83	1.53	20	
1,2-Dibromo-3-chloropropane	14.25	1.0	20	0	71.3	70 - 130	14.87	4.25	20	
1,2-Dibromoethane	19.34	1.0	20	0	96.7	70 - 124	19.89	2.81	20	
1,2-Dichlorobenzene	18.24	1.0	20	0	91.2	70 - 115	18.74	2.71	20	
1,2-Dichloroethane	19.32	1.0	20	0	96.6	70 - 127	19.14	0.916	20	
1,2-Dichloropropane	20.11	1.0	20	0	101	70 - 122	20.52	1.99	20	
1,3,5-Trimethylbenzene	17.6	1.0	20	0	88.0	70 - 126	18.38	4.3	20	
1,3-Dichlorobenzene	18.73	1.0	20	0	93.6	70 - 119	18.85	0.636	20	
1,3-Dichloropropane	18.95	1.0	20	0	94.7	70 - 121	19.64	3.62	20	
1,4-Dichlorobenzene	18.82	1.0	20	0	94.1	70 - 114	19.01	1.04	20	
2,2-Dichloropropane	18.81	1.0	20	0	94.0	70 - 130	20.09	6.58	20	
2-Butanone	34.35	2.0	40	0	85.9	70 - 130	34.38	0.0911	20	
2-Chlorotoluene	19.91	1.0	20	0	99.6	70 - 130	20.71	3.92	20	
2-Hexanone	34.65	2.0	40	0	86.6	70 - 130	34.15	1.46	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.55	2.26	20	
4-Isopropyltoluene	17.1	1.0	20	0	85.5	70 - 130	17.83	4.21	20	
4-Methyl-2-pentanone	35.68	2.0	40	0	89.2	70 - 130	36.27	1.63	20	
Acetone	32.18	2.0	40	0	80.4	70 - 130	35.8	10.7	20	
Benzene	19.68	1.0	20	0	98.4	70 - 127	20.48	3.98	20	
Bromobenzene	18.59	1.0	20	0	93.0	70 - 115	19.06	2.49	20	
Bromochloromethane	19.83	1.0	20	0	99.1	70 - 127	19.62	1.07	20	
Bromodichloromethane	19.79	1.0	20	0	98.9	70 - 124	20.37	2.89	20	
Bromoform	18.27	1.0	20	0	91.3	70 - 129	18.57	1.65	20	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.98	1.0	20	0	105	70 - 130	23.12	9.72	20	
Carbon disulfide	36.19	2.0	40	0	90.5	70 - 130	39.49	8.72	20	
Carbon tetrachloride	20.74	1.0	20	0	104	70 - 130	21.31	2.73	20	
Chlorobenzene	19.53	1.0	20	0	97.6	70 - 114	20.51	4.92	20	
Chloroethane	18.48	1.0	20	0	92.4	70 - 130	19.96	7.72	20	
Chloroform	18.47	1.0	20	0	92.4	70 - 125	18.95	2.55	20	
Chloromethane	15.83	1.0	20	0	79.1	70 - 130	16.31	3.01	20	
cis-1,2-Dichloroethene	19.71	1.0	20	0	98.5	70 - 128	20.24	2.69	20	
cis-1,3-Dichloropropene	20.74	1.0	20	0	104	70 - 125	21.1	1.73	20	
Dibromochloromethane	18.89	1.0	20	0	94.5	70 - 124	19.32	2.25	20	
Dibromomethane	20.01	1.0	20	0	100	70 - 124	20.47	2.29	20	
Dichlorodifluoromethane	14.34	1.0	20	0	71.7	70 - 130	16.46	13.8	20	
Ethylbenzene	20.91	1.0	20	0	105	70 - 124	22.32	6.53	20	
Hexachlorobutadiene	17.83	1.0	20	0	89.2	70 - 130	18.59	4.17	20	
Isopropylbenzene	18.68	1.0	20	0	93.4	70 - 130	19.83	5.99	20	
m,p-Xylene	41.93	2.0	40	0	105	70 - 130	44.08	5	20	
Methylene chloride	19.21	2.0	20	0	96.1	70 - 128	19.79	2.98	20	
Naphthalene	15.43	1.0	20	0	77.2	70 - 130	14.85	3.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.62	3.74	20	
n-Propylbenzene	19.91	1.0	20	0	99.6	70 - 130	21.13	5.92	20	
o-Xylene	20.75	1.0	20	0	104	70 - 124	21.69	4.43	20	
sec-Butylbenzene	17.69	1.0	20	0	88.5	70 - 130	18.74	5.72	20	
Styrene	19.17	1.0	20	0	95.8	70 - 130	19.72	2.83	20	
tert-Butylbenzene	19.41	1.0	20	0	97.1	70 - 130	20.67	6.26	20	
Tetrachloroethene	19.01	1.0	20	0	95.0	70 - 130	20.42	7.18	20	
Toluene	18.86	1.0	20	0	94.3	70 - 123	20.05	6.11	20	
trans-1,2-Dichloroethene	19.55	1.0	20	0	97.8	70 - 130	20.57	5.06	20	
trans-1,3-Dichloropropene	21.15	1.0	20	0	106	70 - 121	21.52	1.72	20	
Trichloroethene	20.09	1.0	20	0	100	70 - 129	21.28	5.75	20	
Trichlorofluoromethane	19.62	1.0	20	0	98.1	70 - 130	21.09	7.23	20	
Vinyl chloride	18.52	1.0	20	0	92.6	70 - 130	20.12	8.3	20	
Surr: 1,2-Dichloroethane-d4	*46.4*	*1.0*	*50*	*0*	*92.8*	*70 - 126*	*47.12*	*1.54*	*20*	
Surr: 4-Bromofluorobenzene	*50.76*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.83*	*2.1*	*20*	
Surr: Dibromofluoromethane	*46.93*	*1.0*	*50*	*0*	*93.9*	*77 - 123*	*47.28*	*0.751*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*	*44.83*	*0.00577*	*20*	

The following samples were analyzed in this batch: HS18100548-09 HS18100548-10 HS18100548-12 HS18100548-13 HS18100548-14

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** 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	*45.18*	*1.0*	*50*	*0*	*90.4*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.92*	*1.0*	*50*	*0*	*97.8*	*82 - 115*				
Surr: Dibromofluoromethane	*48*	*1.0*	*50*	*0*	*96.0*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.88*	*1.0*	*50*	*0*	*91.8*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** 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	21.75	1.0	20	0	109	77 - 118				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.4	70 - 130				
1,1,2,2-Tetrachloroethane	19.27	1.0	20	0	96.4	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.29	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.3	1.0	20	0	107	77 - 113				
1,1-Dichloroethane	20.01	1.0	20	0	100	71 - 122				
1,1-Dichloroethene	20.15	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	21.55	1.0	20	0	108	78 - 118				
1,2,3-Trichlorobenzene	20.5	1.0	20	0	103	70 - 130				
1,2,3-Trichloropropane	19.93	1.0	20	0	99.7	70 - 127				
1,2,4-Trichlorobenzene	20.89	1.0	20	0	104	77 - 126				
1,2,4-Trimethylbenzene	21.83	1.0	20	0	109	73 - 121				
1,2-Dibromo-3-chloropropane	19.8	1.0	20	0	99.0	70 - 130				
1,2-Dibromoethane	21.98	1.0	20	0	110	76 - 123				
1,2-Dichlorobenzene	20.64	1.0	20	0	103	77 - 113				
1,2-Dichloroethane	21.37	1.0	20	0	107	70 - 124				
1,2-Dichloropropane	21.87	1.0	20	0	109	72 - 119				
1,3,5-Trimethylbenzene	19.61	1.0	20	0	98.1	75 - 118				
1,3-Dichlorobenzene	20.77	1.0	20	0	104	78 - 118				
1,3-Dichloropropane	21.46	1.0	20	0	107	75 - 116				
1,4-Dichlorobenzene	20.68	1.0	20	0	103	79 - 113				
2,2-Dichloropropane	23.09	1.0	20	0	115	70 - 130				
2-Butanone	43.1	2.0	40	0	108	70 - 130				
2-Chlorotoluene	21.68	1.0	20	0	108	70 - 128				
2-Hexanone	44.08	2.0	40	0	110	70 - 130				
4-Chlorotoluene	22.11	1.0	20	0	111	74 - 126				
4-Isopropyltoluene	19.02	1.0	20	0	95.1	74 - 126				
4-Methyl-2-pentanone	44.25	2.0	40	0	111	70 - 130				
Acetone	43.75	2.0	40	0	109	70 - 130				
Benzene	21.17	1.0	20	0	106	74 - 120				
Bromobenzene	20.29	1.0	20	0	101	78 - 113				
Bromochloromethane	20.85	1.0	20	0	104	76 - 124				
Bromodichloromethane	21.72	1.0	20	0	109	74 - 122				
Bromoform	21.81	1.0	20	0	109	73 - 128				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.93	1.0	20	0	125	70 - 130				
Carbon disulfide	39.37	2.0	40	0	98.4	70 - 130				
Carbon tetrachloride	19.96	1.0	20	0	99.8	71 - 125				
Chlorobenzene	21.63	1.0	20	0	108	76 - 113				
Chloroethane	20.34	1.0	20	0	102	70 - 130				
Chloroform	19.75	1.0	20	0	98.8	71 - 121				
Chloromethane	18.4	1.0	20	0	92.0	70 - 129				
cis-1,2-Dichloroethene	21.1	1.0	20	0	106	75 - 122				
cis-1,3-Dichloropropene	22.84	1.0	20	0	114	73 - 127				
Dibromochloromethane	21.45	1.0	20	0	107	77 - 122				
Dibromomethane	21.93	1.0	20	0	110	78 - 121				
Dichlorodifluoromethane	14.93	1.0	20	0	74.7	70 - 130				
Ethylbenzene	22.99	1.0	20	0	115	77 - 117				
Hexachlorobutadiene	20.85	1.0	20	0	104	70 - 130				
Isopropylbenzene	20.82	1.0	20	0	104	73 - 127				
m,p-Xylene	47.43	2.0	40	0	119	77 - 122				
Methylene chloride	21.37	2.0	20	0	107	70 - 127				
Naphthalene	19.83	1.0	20	0	99.1	70 - 130				
n-Butylbenzene	21.2	1.0	20	0	106	72 - 130				
n-Propylbenzene	22.35	1.0	20	0	112	73 - 124				
o-Xylene	23.2	1.0	20	0	116	75 - 119				
sec-Butylbenzene	19.45	1.0	20	0	97.2	73 - 128				
Styrene	21.99	1.0	20	0	110	72 - 126				
tert-Butylbenzene	21.99	1.0	20	0	110	73 - 124				
Tetrachloroethene	20.63	1.0	20	0	103	76 - 119				
Toluene	20.87	1.0	20	0	104	77 - 118				
trans-1,2-Dichloroethene	21.21	1.0	20	0	106	72 - 127				
trans-1,3-Dichloropropene	23.25	1.0	20	0	116	77 - 119				
Trichloroethene	21.88	1.0	20	0	109	77 - 121				
Trichlorofluoromethane	21.23	1.0	20	0	106	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.95*	*1.0*	*50*	*0*	*95.9*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.45*	*1.0*	*50*	*0*	*101*	*82 - 115*				
Surr: Dibromofluoromethane	*46.69*	*1.0*	*50*	*0*	*93.4*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.49*	*1.0*	*50*	*0*	*89.0*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782259** 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	20.18	1.0	20	0	101	70 - 120				
1,1,1-Trichloroethane	19.32	1.0	20	0	96.6	70 - 130				
1,1,2,2-Tetrachloroethane	17.91	1.0	20	0	89.5	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	24.02	1.0	20	0	120	70 - 130				
1,1,2-Trichloroethane	20.01	1.0	20	0	100	70 - 117				
1,1-Dichloroethane	19.4	1.0	20	0	97.0	70 - 127				
1,1-Dichloroethene	22.7	1.0	20	3.55	95.8	70 - 130				
1,1-Dichloropropene	22.16	1.0	20	0	111	70 - 129				
1,2,3-Trichlorobenzene	17.36	1.0	20	0	86.8	70 - 130				
1,2,3-Trichloropropane	18.33	1.0	20	0	91.6	70 - 130				
1,2,4-Trichlorobenzene	18.21	1.0	20	0	91.1	70 - 125				
1,2,4-Trimethylbenzene	19.62	1.0	20	0	98.1	70 - 125				
1,2-Dibromo-3-chloropropane	17.74	1.0	20	0	88.7	70 - 130				
1,2-Dibromoethane	20.65	1.0	20	0	103	70 - 124				
1,2-Dichlorobenzene	18.6	1.0	20	0	93.0	70 - 115				
1,2-Dichloroethane	24.04	1.0	20	3.762	101	70 - 127				
1,2-Dichloropropane	20.83	1.0	20	0	104	70 - 122				
1,3,5-Trimethylbenzene	18.19	1.0	20	0	90.9	70 - 126				
1,3-Dichlorobenzene	18.98	1.0	20	0	94.9	70 - 119				
1,3-Dichloropropane	20.27	1.0	20	0	101	70 - 121				
1,4-Dichlorobenzene	18.95	1.0	20	0	94.7	70 - 114				
2,2-Dichloropropane	21.02	1.0	20	0	105	70 - 130				
2-Butanone	38.13	2.0	40	0	95.3	70 - 130				
2-Chlorotoluene	20.09	1.0	20	0	100	70 - 130				
2-Hexanone	41.2	2.0	40	0	103	70 - 130				
4-Chlorotoluene	20.48	1.0	20	0	102	70 - 130				
4-Isopropyltoluene	17.74	1.0	20	0	88.7	70 - 130				
4-Methyl-2-pentanone	41.05	2.0	40	0	103	70 - 130				
Acetone	34.42	2.0	40	0	86.0	70 - 130				
Benzene	20.81	1.0	20	0.5277	101	70 - 127				
Bromobenzene	18.59	1.0	20	0	92.9	70 - 115				
Bromochloromethane	20.15	1.0	20	0	101	70 - 127				
Bromodichloromethane	20.29	1.0	20	0	101	70 - 124				
Bromoform	20.42	1.0	20	0	102	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782259** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	21.92	1.0	20	0	110	70 - 130				
Carbon disulfide	40.63	2.0	40	0	102	70 - 130				
Carbon tetrachloride	21.78	1.0	20	0	109	70 - 130				
Chlorobenzene	20.6	1.0	20	0	103	70 - 114				
Chloroethane	21.35	1.0	20	0	107	70 - 130				
Chloroform	19	1.0	20	0	95.0	70 - 125				
Chloromethane	16.72	1.0	20	0	83.6	70 - 130				
cis-1,2-Dichloroethene	232.9	1.0	20	212.7	101	70 - 128				EO
cis-1,3-Dichloropropene	20.64	1.0	20	0	103	70 - 125				
Dibromochloromethane	19.61	1.0	20	0	98.1	70 - 124				
Dibromomethane	21.09	1.0	20	0	105	70 - 124				
Dichlorodifluoromethane	14.69	1.0	20	0	73.5	70 - 130				
Ethylbenzene	22.17	1.0	20	0	111	70 - 124				
Hexachlorobutadiene	18.11	1.0	20	0	90.6	70 - 130				
Isopropylbenzene	19.88	1.0	20	0	99.4	70 - 130				
m,p-Xylene	43.96	2.0	40	0	110	70 - 130				
Methylene chloride	19.7	2.0	20	0	98.5	70 - 128				
Naphthalene	16.84	1.0	20	0	84.2	70 - 130				
n-Butylbenzene	19.56	1.0	20	0	97.8	70 - 130				
n-Propylbenzene	20.51	1.0	20	0	103	70 - 130				
o-Xylene	21.5	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.26	1.0	20	0	91.3	70 - 130				
Styrene	20	1.0	20	0	100	70 - 130				
tert-Butylbenzene	20.09	1.0	20	0	100	70 - 130				
Tetrachloroethene	19.95	1.0	20	0	99.8	70 - 130				
Toluene	20.04	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	21.73	1.0	20	0	109	70 - 130				
trans-1,3-Dichloropropene	21.62	1.0	20	0	108	70 - 121				
Trichloroethene	573.1	1.0	20	561.2	59.8	70 - 129				SEO
Trichlorofluoromethane	20.48	1.0	20	0	102	70 - 130				
Vinyl chloride	23.88	1.0	20	4.474	97.0	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.93*	*1.0*	*50*	*0*	*95.9*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.6*	*1.0*	*50*	*0*	*103*	*81 - 113*				
Surr: Dibromofluoromethane	*47.71*	*1.0*	*50*	*0*	*95.4*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782259** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.93*	*1.0*	*50*	*0*	*89.9*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782260** 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	19.75	1.0	20	0	98.8	70 - 120	20.18	2.13	20	
1,1,1-Trichloroethane	17.42	1.0	20	0	87.1	70 - 130	19.32	10.3	20	
1,1,2,2-Tetrachloroethane	18.3	1.0	20	0	91.5	70 - 123	17.91	2.14	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	20.52	1.0	20	0	103	70 - 130	24.02	15.7	20	
1,1,2-Trichloroethane	19.87	1.0	20	0	99.3	70 - 117	20.01	0.72	20	
1,1-Dichloroethane	19.19	1.0	20	0	96.0	70 - 127	19.4	1.06	20	
1,1-Dichloroethene	21.37	1.0	20	3.55	89.1	70 - 130	22.7	6.05	20	
1,1-Dichloropropene	20.34	1.0	20	0	102	70 - 129	22.16	8.57	20	
1,2,3-Trichlorobenzene	17.64	1.0	20	0	88.2	70 - 130	17.36	1.57	20	
1,2,3-Trichloropropane	18.31	1.0	20	0	91.5	70 - 130	18.33	0.113	20	
1,2,4-Trichlorobenzene	18.38	1.0	20	0	91.9	70 - 125	18.21	0.926	20	
1,2,4-Trimethylbenzene	19.65	1.0	20	0	98.2	70 - 125	19.62	0.144	20	
1,2-Dibromo-3-chloropropane	17.5	1.0	20	0	87.5	70 - 130	17.74	1.34	20	
1,2-Dibromoethane	20.23	1.0	20	0	101	70 - 124	20.65	2.05	20	
1,2-Dichlorobenzene	18.6	1.0	20	0	93.0	70 - 115	18.6	0.00724	20	
1,2-Dichloroethane	23.89	1.0	20	3.762	101	70 - 127	24.04	0.603	20	
1,2-Dichloropropane	19.7	1.0	20	0	98.5	70 - 122	20.83	5.58	20	
1,3,5-Trimethylbenzene	17.62	1.0	20	0	88.1	70 - 126	18.19	3.19	20	
1,3-Dichlorobenzene	18.81	1.0	20	0	94.1	70 - 119	18.98	0.881	20	
1,3-Dichloropropane	19.74	1.0	20	0	98.7	70 - 121	20.27	2.64	20	
1,4-Dichlorobenzene	18.94	1.0	20	0	94.7	70 - 114	18.95	0.0219	20	
2,2-Dichloropropane	18.98	1.0	20	0	94.9	70 - 130	21.02	10.2	20	
2-Butanone	37.77	2.0	40	0	94.4	70 - 130	38.13	0.952	20	
2-Chlorotoluene	19.64	1.0	20	0	98.2	70 - 130	20.09	2.25	20	
2-Hexanone	40.96	2.0	40	0	102	70 - 130	41.2	0.589	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.48	1.92	20	
4-Isopropyltoluene	17.08	1.0	20	0	85.4	70 - 130	17.74	3.8	20	
4-Methyl-2-pentanone	41.01	2.0	40	0	103	70 - 130	41.05	0.0964	20	
Acetone	39.27	2.0	40	0	98.2	70 - 130	34.42	13.2	20	
Benzene	19.75	1.0	20	0.5277	96.1	70 - 127	20.81	5.25	20	
Bromobenzene	18.67	1.0	20	0	93.4	70 - 115	18.59	0.463	20	
Bromochloromethane	19.71	1.0	20	0	98.5	70 - 127	20.15	2.25	20	
Bromodichloromethane	19.76	1.0	20	0	98.8	70 - 124	20.29	2.64	20	
Bromoform	19.86	1.0	20	0	99.3	70 - 129	20.42	2.82	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782260** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	19.91	1.0	20	0	99.6	70 - 130	21.92	9.62	20	
Carbon disulfide	37.59	2.0	40	0	94.0	70 - 130	40.63	7.77	20	
Carbon tetrachloride	20.65	1.0	20	0	103	70 - 130	21.78	5.29	20	
Chlorobenzene	19.96	1.0	20	0	99.8	70 - 114	20.6	3.11	20	
Chloroethane	20.59	1.0	20	0	103	70 - 130	21.35	3.64	20	
Chloroform	18.04	1.0	20	0	90.2	70 - 125	19	5.2	20	
Chloromethane	15.25	1.0	20	0	76.3	70 - 130	16.72	9.16	20	
cis-1,2-Dichloroethene	226.8	1.0	20	212.7	70.6	70 - 128	232.9	2.64	20	EO
cis-1,3-Dichloropropene	20.87	1.0	20	0	104	70 - 125	20.64	1.09	20	
Dibromochloromethane	19.47	1.0	20	0	97.4	70 - 124	19.61	0.734	20	
Dibromomethane	20.41	1.0	20	0	102	70 - 124	21.09	3.26	20	
Dichlorodifluoromethane	13.19	1.0	20	0	66.0	70 - 130	14.69	10.8	20	S
Ethylbenzene	21.25	1.0	20	0	106	70 - 124	22.17	4.2	20	
Hexachlorobutadiene	17.97	1.0	20	0	89.9	70 - 130	18.11	0.764	20	
Isopropylbenzene	18.93	1.0	20	0	94.7	70 - 130	19.88	4.86	20	
m,p-Xylene	42.1	2.0	40	0	105	70 - 130	43.96	4.32	20	
Methylene chloride	18.35	2.0	20	0	91.7	70 - 128	19.7	7.1	20	
Naphthalene	17.85	1.0	20	0	89.3	70 - 130	16.84	5.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.56	3.4	20	
n-Propylbenzene	19.58	1.0	20	0	97.9	70 - 130	20.51	4.64	20	
o-Xylene	20.28	1.0	20	0	101	70 - 124	21.5	5.87	20	
sec-Butylbenzene	17.48	1.0	20	0	87.4	70 - 130	18.26	4.4	20	
Styrene	19.66	1.0	20	0	98.3	70 - 130	20	1.72	20	
tert-Butylbenzene	19.54	1.0	20	0	97.7	70 - 130	20.09	2.76	20	
Tetrachloroethene	18.79	1.0	20	0	94.0	70 - 130	19.95	5.97	20	
Toluene	18.93	1.0	20	0	94.6	70 - 123	20.04	5.7	20	
trans-1,2-Dichloroethene	20.47	1.0	20	0	102	70 - 130	21.73	5.95	20	
trans-1,3-Dichloropropene	21.43	1.0	20	0	107	70 - 121	21.62	0.868	20	
Trichloroethene	549.7	1.0	20	561.2	-57.6	70 - 129	573.1	4.18	20	SEO
Trichlorofluoromethane	18.47	1.0	20	0	92.3	70 - 130	20.48	10.3	20	
Vinyl chloride	21.31	1.0	20	4.474	84.2	70 - 130	23.88	11.4	20	
Surr: 1,2-Dichloroethane-d4	*47.26*	*1.0*	*50*	*0*	*94.5*	*70 - 126*	*47.93*	*1.42*	*20*	
Surr: 4-Bromofluorobenzene	*50.98*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.6*	*1.21*	*20*	
Surr: Dibromofluoromethane	*47.27*	*1.0*	*50*	*0*	*94.5*	*77 - 123*	*47.71*	*0.931*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782260** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.75*	*1.0*	*50*	*0*	*89.5*	*82 - 127*	*44.93*	*0.394*	*20*	

The following samples were analyzed in this batch: HS18100548-02

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325461 (0) **Instrument: ICS2100** **Method: ANIONS BY SW9056A**

MBLK Sample ID: **WBLKW1-101118** Units: **mg/L** Analysis Date: **11-Oct-2018 18:26**
Client ID: Run ID: **ICS2100_325461** SeqNo: **4773169** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U
Chloride	0.500	0.500								U
Fluoride	0.100	0.100								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

LCS Sample ID: **WLCSW1-101118** Units: **mg/L** Analysis Date: **11-Oct-2018 18:41**
Client ID: Run ID: **ICS2100_325461** SeqNo: **4773170** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.764	0.100	4	0	94.1	80 - 120				
Chloride	20.54	0.500	20	0	103	80 - 120				
Fluoride	4.321	0.100	4	0	108	80 - 120				
Nitrogen, Nitrate (As N)	4.021	0.100	4	0	101	80 - 120				
Nitrogen, Nitrite (As N)	4.286	0.100	4	0	107	80 - 120				
Sulfate	20.29	0.500	20	0	101	80 - 120				

LCSD Sample ID: **WLCSDW1-101118** Units: **mg/L** Analysis Date: **11-Oct-2018 18:56**
Client ID: Run ID: **ICS2100_325461** SeqNo: **4773171** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.7	0.100	4	0	92.5	80 - 120	3.764	1.71	20	
Chloride	20.14	0.500	20	0	101	80 - 120	20.54	1.96	20	
Fluoride	4.244	0.100	4	0	106	80 - 120	4.321	1.8	20	
Nitrogen, Nitrate (As N)	3.951	0.100	4	0	98.8	80 - 120	4.021	1.76	20	
Nitrogen, Nitrite (As N)	4.214	0.100	4	0	105	80 - 120	4.286	1.69	20	
Sulfate	19.99	0.500	20	0	100.0	80 - 120	20.29	1.47	20	

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325461 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MS Sample ID: **HS18100564-02MS** Units: **mg/L** Analysis Date: **11-Oct-2018 19:54**
Client ID: Run ID: **ICS2100_325461** SeqNo: **4773173** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	1.685	0.100	2	0	84.2	80 - 120				
Chloride	17.58	0.500	10	7.274	103	80 - 120				
Fluoride	2.472	0.100	2	0.248	111	80 - 120				
Nitrogen, Nitrate (As N)	2.005	0.100	2	0	100	80 - 120				
Nitrogen, Nitrite (As N)	2.106	0.100	2	0	105	80 - 120				
Sulfate	21.24	0.500	10	11.06	102	80 - 120				

MSD Sample ID: **HS18100564-02MSD** Units: **mg/L** Analysis Date: **11-Oct-2018 20:08**
Client ID: Run ID: **ICS2100_325461** SeqNo: **4773174** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	1.686	0.100	2	0	84.3	80 - 120	1.685	0.0593	20	
Chloride	17.63	0.500	10	7.274	104	80 - 120	17.58	0.295	20	
Fluoride	2.484	0.100	2	0.248	112	80 - 120	2.472	0.484	20	
Nitrogen, Nitrate (As N)	2.005	0.100	2	0	100	80 - 120	2.005	0	20	
Nitrogen, Nitrite (As N)	2.107	0.100	2	0	105	80 - 120	2.106	0.0475	20	
Sulfate	21.27	0.500	10	11.06	102	80 - 120	21.24	0.136	20	

The following samples were analyzed in this batch: HS18100548-09 HS18100548-10 HS18100548-13 HS18100548-14

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: HS18100548

QC BATCH REPORT

Batch ID: R325562 (0) **Instrument:** ManTech01 **Method:** ALKALINITY BY SM2320B

MBLK Sample ID: **WBLKW1-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 13:21**
Client ID: Run ID: **ManTech01_325562** SeqNo: **4775229** 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

LCS Sample ID: **WLCS1-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 13:30**
Client ID: Run ID: **ManTech01_325562** SeqNo: **4775230** 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				

LCSD Sample ID: **WLCSD1-181016** Units: **mg/L** Analysis Date: **16-Oct-2018 13:39**
Client ID: Run ID: **ManTech01_325562** SeqNo: **4775231** 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)	1070	5.00	1000	0	107	85 - 115	1077	0.645	20	

DUP Sample ID: **HS18100431-03DUP** Units: **mg/L** Analysis Date: **16-Oct-2018 13:56**
Client ID: Run ID: **ManTech01_325562** SeqNo: **4775233** 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)	916.4	5.00					921.3	0.53	20	

The following samples were analyzed in this batch: HS18100548-09 HS18100548-10 HS18100548-13

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant LHAAP 50
WorkOrder: **HS18100548**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/L	Milligrams per Liter

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100548

Date/Time Received: **11-Oct-2018 09:05**
Received by: **RPG**

Checklist completed by: *Jared R. Makan* eSignature 11-Oct-2018 Date

Reviewed by: *RJ Modashia* eSignature 11-Oct-2018 Date

Matrices: **Water**

Carrier name: **FedEx Priority Overnight**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:N/A
Samplers name present on COC?	Yes ☐	No ☑	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s):	2.8c/2.4c UC/C	IR11
Cooler(s)/Kit(s):	25093	
Date/Time sample(s) sent to storage:	10/11/2018 12:00	

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:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181010 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-50			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060		
16TB02-181010	FIELD QC				LIQ	10/10/2018	830	2		2							
16WW38-181010	16WW38	29.18	29.48	FT	GW	10/10/2018	949	4		3	1						
16WW44-181010	16WW44	25.8	26.76	FT	GW	10/10/2018	1005	4		3	1						
16WW33-181010	16WW33	31.39	31.75	FT	GW	10/10/2018	1020	4		3	1						
16WW37-181010	16WW37	29.28	30.29	FT	GW	10/10/2018	1039	4		3	1						
16WW45-181010	16WW45	25.81	26.73	FT	GW	10/10/2018	1110	4		3	1						
16WW14-181010	16WW14	26.71	26.96	FT	GW	10/10/2018	1202	4		3	1						
16WW34-181010	16WW34	31.35	31.82	FT	GW	10/10/2018	1305	4		3	1						
16WW35-181010	16WW35	19.48	20.29	FT	GW	10/10/2018	1311	11		3	1	1	1	3	2		
16WW16-181010	16WW16	23.28	23.43	FT	GW	10/10/2018	1315	11		3	1	1	1	3	2		
16WW31-181010	16WW31	31.45	31.55	FT	GW	10/10/2018	1430	4		3	1						
16WW31-181010-FD	16WW31	31.45	31.55	FT	GW	10/10/2018	1430	4		3	1						
16WW31-181010-MS	16WW31	31.45	31.55	FT	GW	10/10/2018	1430	4		3	1						
16WW31-181010-MSD	16WW31	31.45	31.55	FT	GW	10/10/2018	1430	4		3	1						
16WW22-181010	16WW22	29.17	29.53	FT	GW	10/10/2018	1500	11		3	1	1	1	3	2		
16WW39-181010	16WW39	21.66	22.04	FT	GW	10/10/2018	1539	5		3	1		1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible]	10/10/18 1815	[illegible]	10/11/18 04:05

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant LHAAP 50

HS18100548

25013 ulc 2.5
[illegible]

RIGHT SOLUTIONS | RIGHT PARTNER

CUST ratory Group
DATE: 10 cliff Rd. Ste#210
Signature: n, TX 77099
LH 530.5656

ALS Labo DY SEAL
10450 Star 10-18 10/11/18
Houst
281 HAAP

CUSTOD Y SEAL
DATE: 10-10 -18 10/11/18
Signature:
LHA AP

ALS Laborat ory Group
10450 Stanclif f Rd. Ste#210
Houston, TX 77099
281.53 0.5656

FedEx
TRK# 4380 9533 1403
0221
AB SGRA
THU - 11 OCT 10:30A
PRIORITY OVERNIGHT
77099
TX-US IAH

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828819; 1828820; 1828821; 1828822

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2156 (225255)

General Set Information: There were sixteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field sample 1828821001 was analyzed and reported from a 1:1,000 dilution. Field samples 1828822008/09/15 were analyzed and reported from a 1:10 dilutions. The reporting limits have been adjusted accordingly.

Method QC data: The method blank (LMB 623846) was less than 1/2 the CRDL. The recovery for the LCS (623847) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 18288011/12 (Client ID: 16WW31-181010). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The percent recoveries and relative percent difference (RPD) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 25, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 25, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1828822**
Project ID: HS18100548 101018
Purchase Order: HS18100548
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW38-181010	1828822001	10/10/18	10/12/18	
16WW44-181010	1828822002	10/10/18	10/12/18	
16WW33-181010	1828822003	10/10/18	10/12/18	
16WW37-181010	1828822004	10/10/18	10/12/18	
16WW45-181010	1828822005	10/10/18	10/12/18	
16WW14-181010	1828822006	10/10/18	10/12/18	
16WW34-181010	1828822007	10/10/18	10/12/18	
16WW35-181010	1828822008	10/10/18	10/12/18	
16WW16-181010	1828822009	10/10/18	10/12/18	
16WW31-181010	1828822010	10/10/18	10/12/18	
16WW31-181010-FD	1828822013	10/10/18	10/12/18	
16WW22-181010	1828822014	10/10/18	10/12/18	
16WW39-181010	1828822015	10/10/18	10/12/18	

Client QC ID *	Lab ID	Collect Date	Receive Date	Sampling Site
16WW31-181010MS	1828822011	10/10/18	10/12/18	
16WW31-181010MSD	1828822012	10/10/18	10/12/18	

***Client QC is reported as part of the Quality Control results report, if requested.**

ANALYTICAL REPORT

Workorder: 34-1828822
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW38-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822001 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 09:59 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW44-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822002 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 10:13 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW33-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822003 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 10:27 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW37-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822004 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 10:42 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

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ANALYTICAL REPORT

Workorder: 34-1828822
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW45-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822005 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 10:56 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW14-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822006 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 11:10 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW34-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822007 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 11:24 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW35-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822008 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 12:07 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**420**	10	20	40	10	

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ANALYTICAL REPORT

Workorder: 34-1828822
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW16-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822009 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 12:21 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**420**	10	20	40	10	

Sample ID: **16WW31-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822010 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 12:35 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW31-181010-FD** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822013 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 14:00 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW22-181010** | Sampling Site: NA | Collected: 10/10/2018
Lab ID: 1828822014 | Media: 125 mL Nalgene | Received: 10/12/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2156 (HBN: 225255) | **Percent Solid:** NA
Analyzed: 10/19/2018 14:14 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**5.5**	1.0	2.0	4.0	1	

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ANALYTICAL REPORT

Workorder: 34-1828822
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID:	16WW39-181010	Sampling Site:	NA	Collected:	10/10/2018
Lab ID:	1828822015	Media:	125 mL Nalgene	Received:	10/12/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation:	Not Applicable	**Analysis:**	EPA 6850, DoD QSM Water	**Instrument ID:**	LCMS04
		Batch:	ELMS/2156 (HBN: 225255)	**Percent Solid:**	NA
		Analyzed:	10/19/2018 14:33	**Report Basis:**	Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**120**	10	20	40	10	

Comments

Workorder: **1828822**

Field samples 1828822008/09/15 were analyzed and reported from a 1:10 dilutions. The reporting limits have been adjusted accordingly.

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/24/2018 13:21	/S/ Stephen Brose 10/25/2018 13:31

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1828822
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1828822

Limits: Client SOW/Contract Specified
Basis: DoD QSM
Preparation: NA
Batch: NA
Prepared By: NA
Analysis: EPA 6850, DoD QSM
Batch: ELMS/2156 (HBN: 225255)
Analyzed By: Thomas Bosch

Blank

LMB: 623846
Analyzed: 10/19/2018 08:46
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 623847
Analyzed: 10/19/2018 09:00
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.90	5.00	98.0	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828822010
Analyzed: 10/19/2018 12:35
Dilution: 1
Units: ug/L

MS: 1828822011
Analyzed: 10/19/2018 13:32
Dilution: 1
Units: ug/L

MSD: 1828822012
Analyzed: 10/19/2018 14:47
Dilution: 1
Units: ug/L

Analyte	Result	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Perchlorate	ND	4.96	5	99.1	78.8	123.8	4.83	96.5	2.69	0.0	20.0

Continuing Calibration Verification

CCV: 623843
Analyzed: 10/19/2018 08:02
Units: ug/L
Criteria: ± 15%

CCV: 623848
Analyzed: 10/19/2018 11:38
Units: ug/L
Criteria: ± 15%

CCV: 623850
Analyzed: 10/19/2018 15:03
Units: ug/L
Criteria: ± 15%

Analyte	Result	Target	% Rec.	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	24.4	25.0	97.8	24.7	25.0	98.6	24.4	25.0	97.6

Interference Check Sample

ICSA: 623845
Analyzed: 10/19/2018 08:32
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	1.01	1.00	101

Limit of Detection Verification

LODV: 623844
Analyzed: 10/19/2018 08:18
Units: ug/L
Criteria: ± 50%

LODV: 623849
Analyzed: 10/19/2018 11:52
Units: ug/L
Criteria: ± 50%

LODV: 623851
Analyzed: 10/19/2018 15:17
Units: ug/L
Criteria: ± 50%

Analyte	Result	Target	% Rec.	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	0.978	1.00	97.8	1.02	1.00	102	0.983	1.00	98.3

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1828822**

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2156 (HBN: 225255)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/24/2018 13:21	10/25/2018 13:31

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
- Sample and Matrix Duplicate less than 5 times the reporting limit
- Result is above the calibration range
- The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

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www.alsglobal.com

1828822

ract Chain of Custody

COC ID: 9999

1828822

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	HS18100548
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100548-02**	**16WW38-181010**	**Groundwater**	**10 Oct 2018 09:49**
	SUB_Perch-6850			19 Oct 2018
2.	**HS18100548-03**	**16WW44-181010**	**Groundwater**	**10 Oct 2018 10:05**
	SUB_Perch-6850			19 Oct 2018
3.	**HS18100548-04**	**16WW33-181010**	**Groundwater**	**10 Oct 2018 10:20**
	SUB_Perch-6850			19 Oct 2018
4.	**HS18100548-05**	**16WW37-181010**	**Groundwater**	**10 Oct 2018 10:39**
	SUB_Perch-6850			19 Oct 2018
5.	**HS18100548-06**	**16WW45-181010**	**Groundwater**	**10 Oct 2018 11:10**
	SUB_Perch-6850			19 Oct 2018
6.	**HS18100548-07**	**16WW14-181010**	**Groundwater**	**10 Oct 2018 12:02**
	SUB_Perch-6850			19 Oct 2018
7.	**HS18100548-08**	**16WW34-181010**	**Groundwater**	**10 Oct 2018 13:05**
	SUB_Perch-6850			19 Oct 2018
8.	**HS18100548-09**	**16WW35-181010**	**Groundwater**	**10 Oct 2018 13:11**
	SUB_Perch-6850			19 Oct 2018
9.	**HS18100548-10**	**16WW16-181010**	**Groundwater**	**10 Oct 2018 13:15**

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Subcontract Chain of Custody

COC ID: 9999

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
	SUB_Perch-6850			19 Oct 2018
10.	**HS18100548-11**	**16WW31-181010**	**Groundwater**	**10 Oct 2018 14:30** MS/MSD
	SUB_Perch-6850			19 Oct 2018
11.	**HS18100548-12**	**16WW31-181010-FD**	**Groundwater**	**10 Oct 2018 14:30**
	SUB_Perch-6850			19 Oct 2018
12.	**HS18100548-13**	**16WW22-181010**	**Groundwater**	**10 Oct 2018 15:00**
	SUB_Perch-6850			19 Oct 2018
13.	**HS18100548-14**	**16WW39-181010**	**Groundwater**	**10 Oct 2018 15:39**
	SUB_Perch-6850			19 Oct 2018

Comments: Please analyze for the analysis listed above.
Send report to the emails shown above.

HS18100548-11 MS/MSD

QC Level: DOD IV (DoD Data Package)

Relinquished By: J. [illegible] Date/Time: 10/11/18 18:00

Received By: M Schmitt Date/Time: 10/12/2018 9040

Cooler ID(s): Temperature(s):

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100548	*Split:*	**Workorder ID:** 1828822	**Level:** ENV_LVL4
Client: ALS Environmental (Houston)		**Account:** 8101	**Type:** 125Poly
Comments:			**Preservatives**

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	COOL	Requested Analysis: EPA 6850, DoD QSM
1	10/10/2018 09:40	16WW38-181010	1828822001		Water	A	1		A
2	10/10/2018 10:05	16WW44-181010	1828822002		Water	A	1		A
3	10/10/2018 10:20	16WW33-181010	1828822003		Water	A	1		A
4	10/10/2018 10:39	16WW37-181010	1828822004		Water	A	1		A
5	10/10/2018 11:10	16WW45-181010	1828822005		Water	A	1		A
6	10/10/2018 12:02	16WW14-181010	1828822006		Water	A	1		A
7	10/10/2018 13:05	16WW34-181010	1828822007		Water	A	1		A
8	10/10/2018 13:11	16WW35-181010	1828822008		Water	A	1		A
9	10/10/2018 13:15	16WW16-181010	1828822009		Water	A	1		A
10	10/10/2018 14:30	16WW31-181010	1828822010		Water	A	1		A

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/12/2018 09:40	ALS Sample Receiving	Sample Login
Julie Warath	10/15/18 1100	4C	storage
R.33.1	10.17.18/08:45	T.Bond	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100548 | ***Split:*** | **Workorder ID:** 1828822 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
11	10/10/2018 14:30	16WW31-181010MS	1828822011	MS	Water	A	1	A
12	10/10/2018 14:30	16WW31-181010MSD	1828822012	MSD	Water	A	1	A
13	10/10/2018 14:30	16WW31-181010-FD	1828822013	FLDDUP	Water	A	1	A
14	10/10/2018 15:00	16WW22-181010	1828822014		Water	A	1	A
15	10/10/2018 15:39	16WW39-181010	1828822015		Water	A	1	A
16								
17								
18								
19								
20								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/12/2018 09:40	ALS Sample Receiving	Sample Login
Julie Warath	10/15/18 1100	HC	Storage
R.33.1	10/17/18/08:45	T. Bosch	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: 1828822

Date/Time of Receipt: 9:40 10/12/2018

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8821	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: M Schmith (Signature) M Schmith (Printed Name) 10/12/2018 (Date)

CLIENT-RELATED INFORMATION

☐ Missing Cooler	☐ Missing Samples/Bottles	☐ Incorrect Preservation	☐ Insufficient Sample Volume
☐ Cooler Conditions	☐ Broken/Leaking Samples	☐ pH Criteria Not Met	☐ Chain of Custody Problems
☐ Missing Paperwork	☐ Incorrect Bottle Type	☐ Residual Chlorine Present	☐ Other:
☐ Missing/Incorrect Bottle Labels	☐ Cooler Temperatures Out of Range	☐ Head Space in Bottles	

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Part # 159469-434 RJT2 EXP 07/19

Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 11OCT18
ACTWGT: 23.35 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

551C1/88FB/104C

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18100544/546/548/549 RJ

FedEx Express

J8T11180505UPW

TRK# 0201 **4380 9533 5085**

FRI - 12 OCT 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

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Batch Worklist

Batch: ELMS/ 2156 **Created:** 10/19/2018 07:56 **Instrument:** **HBN:** 225255

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828819 [ENV_LVL4]
Workorder: 1828820 [ENV_LVL4]
Workorder: 1828821 [ENV_LVL4]
Workorder: 1828822 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	623843	CCV for HBN 225255 [ELMS/2156]				CCV	3		E685041C3Q	5311		10/25/2018	
2	623844	LODV for HBN 225255 [ELMS/2156				LODV	3		E6850..D3Q	5311		10/25/2018	
3	623845	ICS for HBN 225255 [ELMS/2156]				ICS	3		E6850..D3Q	5311		10/25/2018	
4	623846	LMB for HBN 225255 [ELMS/2156]				LMB	3		E6850Q413Q	5311		10/25/2018	
5	623847	LCS for HBN 225255 [ELMS/2156]				LCS	3		E6850Q413Q	5311		10/25/2018	
6	1828819001	LH18/24-SP650_101018_AIX				SAMPLE	3	1828819001-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
7	1828820001	LH18/24-SP650_101018_AIX				SAMPLE	3	1828820001-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
8	1828821001	LH18/24-SP140_101018				SAMPLE	3	1828821001-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
9	1828822001	16WW38-181010				SAMPLE	3	1828822001-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
10	1828822002	16WW44-181010				SAMPLE	3	1828822002-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
11	1828822003	16WW33-181010				SAMPLE	3	1828822003-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
12	1828822004	16WW37-181010				SAMPLE	3	1828822004-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
13	1828822005	16WW45-181010				SAMPLE	3	1828822005-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
14	1828822006	16WW14-181010				SAMPLE	3	1828822006-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
15	1828822007	16WW34-181010				SAMPLE	3	1828822007-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
16	623848	CCV for HBN 225255 [ELMS/2156]				CCV	3		E685041C3Q	5311		10/25/2018	
17	623849	LODV for HBN 225255 [ELMS/2156				LODV	3		E6850..D3Q	5311		10/25/2018	
18	1828822008	16WW35-181010				SAMPLE	3	1828822008-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
19	1828822009	16WW16-181010				SAMPLE	3	1828822009-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
20	1828822010	16WW31-181010				SAMPLE	3	1828822010-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
21	1828822011	16WW31-181010MS				MS	3	1828822011-A	E6850Q413Q	5480		10/25/2018	
22	1828822012	16WW31-181010MSD				MSD	3	1828822012-A	E6850Q413Q	5480		10/25/2018	
23	1828822013	16WW31-181010-FD				FLDDUP	3	1828822013-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
24	1828822014	16WW22-181010				SAMPLE	3	1828822014-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
25	1828822015	16WW39-181010				SAMPLE	3	1828822015-A	E6850Q41.3	5480	11/7/2018	10/25/2018	
26	623850	CCV for HBN 225255 [ELMS/2156]				CCV	3		E685041C3Q	5311		10/25/2018	

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Batch Worklist

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
27	623851	LODV for HBN 225255 [ELMS/2156				LODV	3		E6850..D3Q	5311		10/25/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828819 (001); 1828820 (001); 1828821 (001); 1828822 (001-15)
ELMS Batch/HBN ID: 2155 (225024)
Prep Date: 10/17/2018 Analysis Date: 10/19/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\19OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 623847; Target = 5.0µg/L. ASTM type II water was used for LMB 623846.

MS/MSD: MS/MSD was performed on samples 1828822011/12 (Client ID: 16WW31-181010). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:
1) Results reported in µg/L. Field sample 1828821001 was analyzed and reported from a 1:1,000 dilution. Field samples 1828822008/09/15 were analyzed and reported from a 1:10 dilutions. The reporting limits have been adjusted accordingly.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225255-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS 2156 HBN. 225255 **Sample Set IDs if Applicable:** 1828819/1828820/1828821/1828822	**Analyst Initials**	**Reviewer Initials**
Calibration standards analyzed and meets criteria	TB	
Standards traceability checked and meets criteria	TB	
Standard curve coefficients evaluated and meet criteria	TB	
ICVs analyzed and meet acceptance criteria	TB	
CCVs analyzed and meet acceptance criteria	TB	
Method Blanks analyzed and meet acceptance criteria	TB	
Retention Time Windows checked	TB	
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	
Surrogate recoveries checked and appropriately addressed	—	
Method Preparation Blanks analyzed and meet acceptance criteria	TB	
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	
RLVS analyzed	TB	
Preparation and analysis hold times met	TB	
Preparation deviations and re-preparations noted when performed	TB	
Analysis deviations and re-analyses noted when performed	TB	
Sample dilution factors noted on reports	TB	
Electronic records in HBN transcription accuracy and completeness checked	TB	
Preparation and analysis calculations checked	TB	
NCRs are completed as necessary NC/CAR#_____	—	
Report forms are complete and accurate	TB	
Manual integrations checked	TB	

TB 10-25-18

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ALS

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard: 43659	**Created By:** Thomas Bosch	**Amount:** 100 mL
MFG: AccuStandard	**Create Date:** 09/17/2018 09:09AM	**Expires:** 07/25/2020
MFG Lot: 218065075		**Usable:** No
Part ID: IC-PER-10X-1		**Lab Lot:** CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O	Description - ASTM Type II Water

Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025
MFG Lot: Not Provided		**Usable:** Yes
Part ID: Not Provided		**Lab Lot:** LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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ALS

STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description - 6850 QC Stock STD 1,000ug/mL**

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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ALS

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK		**Description - Perchlorate ISTD Wrk 1,000ug/L**
Standard: 43730	**Created By:** Thomas Bosch	**Amount:** 25 mL
MFG: ALS/SLC	**Create Date:** 09/20/2018 09:09AM	**Expires:** 09/20/2019
MFG Lot: TNB: 05/09/2018	**Verified By:** Thomas Bosch	**Usable:** Yes
Pipette ID: Not Provided	**Verify Date:**	**Lab Lot:** CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED ANAB ACCREDITED

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL
ANAB ACCREDITED ISO 17025 TESTING & CALIBRATION
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125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

** For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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October 22, 2018

Analytical Report for Service Request No: K1810021

RJ Modashia
ALS Group USA, Corp.
10450 Stancliff Road
Suite 210
Houston, TX 77099-4338

RE: HS18100548

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 12, 2018
For your reference, these analyses have been assigned our service request number **K1810021.**

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. 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.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

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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

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	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 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/anlayte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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ALS Environmental

Client: ALS Environmental - US
Project: HS18100548
Sample Matrix: Water

Service Request: K1810021
Date Received: 10/12/2018

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 water samples were received for analysis at ALS Environmental on 10/12/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Kelley Lovejoy Date 10/22/2018

01029337

Chain of Custody

ALS Environmental—Kelso Laboratory
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Subcontract Chain of Custody

COC ID: 9998

K1810071

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:	HS18100548
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100548-09**	**16WW35-181010**	**Groundwater**	**10 Oct 2018 13:11**
	TOC Analysis with DOD Level IV			19 Oct 2018
2.	**HS18100548-10**	**16WW16-181010**	**Groundwater**	**10 Oct 2018 13:15**
	TOC Analysis with DOD Level IV			19 Oct 2018
3.	**HS18100548-13**	**16WW22-181010**	**Groundwater**	**10 Oct 2018 15:00**
	TOC Analysis with DOD Level IV			19 Oct 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:	J. Mahkan	Date/Time:	10/11/18 18:00
Received By:	[illegible]	Date/Time:	10-12-18 1020
Cooler ID(s):		Temperature(s):	

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01029339

PC CC

Cooler Receipt and Preservation Form

Client ALS - Houston Service Request K18 10021

Received: 10-12-18 Opened: 10-12-18 By: JSP Unloaded: 10-12-18 By: JSP

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 Sides

   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 NA	Tracking Number NA	Filed
-0.2	0.0	1.0	1.2	+0.2	298		4380 9533 5096	

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: _____

RUSH

General Chemistry

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1810021
Project:	HS18100548	**Date Collected:**	10/10/18
Sample Matrix:	Water	**Date Received:**	10/12/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
16WW35-181010	K1810021-001	**44**	10	4	2	20	10/18/18 07:31	
16WW16-181010	K1810021-002	**4.34**	0.50	0.20	0.07	1	10/18/18 09:08	
16WW22-181010	K1810021-003	**2.62**	0.50	0.20	0.07	1	10/18/18 10:13	
Method Blank	K1810021-MB1	ND U	0.50	0.20	0.07	1	10/17/18 23:15	
Method Blank	K1810021-MB2	ND U	0.50	0.20	0.07	1	10/18/18 08:36	

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810021
Project	HS18100548	**Date Collected:**	10/10/18
Sample Matrix:	Water	**Date Received:**	10/12/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**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
16WW35-181010	K1810021-001DUP	10	4	2	44	47	45.5	5	10	10/18/18
16WW16-181010	K1810021-002DUP	0.50	0.20	0.07	4.34	4.02	4.18	8	10	10/18/18
16WW22-181010	K1810021-003DUP	0.50	0.20	0.07	2.62	2.45	2.53	6	10	10/18/18

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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810021
Project:	HS18100548	**Date Collected:**	10/10/18
Sample Matrix:	Water	**Date Received:**	10/12/18
		Date Analyzed:	10/18/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	16WW16-181010	**Units:**	mg/L
Lab Code:	K1810021-002	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1810021-002MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	4.34	26.3	25.0	88	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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810021
Project:	HS18100548	**Date Analyzed:**	10/17/18
Sample Matrix:	Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	611322

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810021-LCS1	21.6	21.9	99	83-117
Lab Control Sample	K1810021-LCS2	21.4	21.9	98	83-117

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1810021
Project: HS18100548

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	611322	KQ1814953-06	10/17/18 22:41	25.0	23.9	95	90-110
CCV2	611322	KQ1814953-07	10/18/18 02:43	25.0	24.4	98	90-110
CCV3	611322	KQ1814953-08	10/18/18 08:02	25.0	24.0	96	90-110
CCV4	611322	KQ1814953-09	10/18/18 12:20	25.0	23.8	95	90-110
CCV5	611322	KQ1814953-10	10/18/18 14:30	25.0	23.7	95	90-110

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**K1810021
Project: HS18100548

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	611322	KQ1814953-01	10/17/18 22:58	0.50	0.20	0.07	ND	U
CCB2	611322	KQ1814953-02	10/18/18 02:59	0.50	0.20	0.07	0.09	J
CCB3	611322	KQ1814953-03	10/18/18 08:19	0.50	0.20	0.07	ND	U
CCB4	611322	KQ1814953-04	10/18/18 12:37	0.50	0.20	0.07	ND	U
CCB5	611322	KQ1814953-05	10/18/18 14:46	0.50	0.20	0.07	ND	U

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Raw Data

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General Chemistry

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Work Request # Original ( ) K1809029, K1809828, K1809960, K1810021, K1810023, K1810100

Tier: IV IV IV IV IV IV

Date Analyzed: 10/17/18

Analyst: BCD / CES

Run # 611322

Analysis: TOC

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 ≥ 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:

RA K1810023-1 % R not within acceptance limits.

RA 0100-1 RPD not within acceptance limits.

Final Approved by: [signature] Date: 10/19/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 611322 **Method/Testcode:** SM 5310 C/TOC T

Id	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1809029-010	Carbon, Total Organic	N/A		Water	1.98 mg/L	10 ml	1.98 mg/L	1	0.07	0.50			10/18/18 00:04	N	IV
1809828-001	Carbon, Total Organic	N/A		Water	3.83 mg/L	10 ml	7.7 mg/L	2	0.2	1.0			10/18/18 00:35	N	IV
1809960-001	Carbon, Total Organic	N/A		Water	9.46 mg/L	10 ml	9.46 mg/L	1	0.07	0.50			10/18/18 01:39	N	IV
1809960-002	Carbon, Total Organic	N/A		Water	5.03 mg/L	10 ml	5.03 mg/L	1	0.07	0.50			10/18/18 02:11	N	IV
1809960-003	Carbon, Total Organic	N/A		Water	2.91 mg/L	10 ml	58 mg/L	20	2	10			10/18/18 03:16	N	IV
1809960-004	Carbon, Total Organic	N/A		Water	23.76 mg/L	10 ml	23.8 mg/L	1	0.07	0.50			10/18/18 03:47	N	IV
1809960-005	Carbon, Total Organic	N/A		Water	10.33 mg/L	10 ml	10.3 mg/L	1	0.07	0.50			10/18/18 04:19	N	IV
1809960-006	Carbon, Total Organic	N/A		Water	1.64 mg/L	10 ml	33 mg/L	20	2	10			10/18/18 04:51	N	IV
1809960-007	Carbon, Total Organic	N/A		Water	2.76 mg/L	10 ml	2.76 mg/L	1	0.07	0.50			10/18/18 05:23	Y	IV
1809960-008	Carbon, Total Organic	N/A		Water	2.65 mg/L	10 ml	2.65 mg/L	1	0.07	0.50			10/18/18 06:27	N	IV
1809960-009	Carbon, Total Organic	N/A		Water	1.53 mg/L	10 ml	31 mg/L	20	2	10			10/18/18 06:59	N	IV
1810021-001	Carbon, Total Organic	N/A		Water	2.22 mg/L	10 ml	44 mg/L	20	2	10			10/18/18 07:31	N	IV
1810021-002	Carbon, Total Organic	N/A		Water	4.34 mg/L	10 ml	4.34 mg/L	1	0.07	0.50			10/18/18 09:08	N	IV
1810021-003	Carbon, Total Organic	N/A		Water	2.62 mg/L	10 ml	2.62 mg/L	1	0.07	0.50			10/18/18 10:13	N	IV
1810023-001	Carbon, Total Organic	N/A		Water	41.16 mg/L	10 ml	41.2 mg/L	1	0.07	0.50			10/18/18 10:45	N	IV
1810100-001	Carbon, Total Organic	N/A		Ground Water	3.22 mg/L	10 ml	3.22 mg/L	1	0.07	0.50			10/18/18 11:49	Y	IV
1810100-002	Carbon, Total Organic	N/A		Ground Water	1.01 mg/L	10 ml	20 mg/L	20	2	10			10/18/18 13:26	N	IV
1810100-003	Carbon, Total Organic	N/A		Ground Water	1.00 mg/L	10 ml	20 mg/L	20	2	10			10/18/18 13:58	N	IV
Q1814953-01	Carbon, Total Organic	CCB		Water	-0.05 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/17/18 22:58	N	IV
Q1814953-02	Carbon, Total Organic	CCB		Water	0.09 mg/L	10 ml	0.09 mg/L J	1	0.07	0.50			10/18/18 02:59	N	IV
Q1814953-03	Carbon, Total Organic	CCB		Water	5.59000000000001E-02 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/18/18 08:19	N	IV
KQ1814953-04	Carbon, Total Organic	CCB		Water	4.34000000000001E-02 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/18/18 12:37	N	IV
KQ1814953-05	Carbon, Total Organic	CCB		Water	-0.05 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/18/18 14:46	N	IV
KQ1814953-06	Carbon, Total Organic	CCV		Water	23.86 mg/L	10 ml	23.9 mg/L	1			96		10/17/18 22:41	N	IV
KQ1814953-07	Carbon, Total Organic	CCV		Water	24.45 mg/L	10 ml	24.4 mg/L	1			98		10/18/18 02:43	N	IV
KQ1814953-08	Carbon, Total Organic	CCV		Water	24.01 mg/L	10 ml	24.0 mg/L	1			96		10/18/18 08:02	N	IV
KQ1814953-09	Carbon, Total Organic	CCV		Water	23.77 mg/L	10 ml	23.8 mg/L	1			95		10/18/18 12:20	N	IV
KQ1814953-10	Carbon, Total Organic	CCV		Water	23.67 mg/L	10 ml	23.7 mg/L	1			95		10/18/18 14:30	N	IV
KQ1814953-11	Carbon, Total Organic	MB		Water	-0.09 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/17/18 23:15	N	IV
KQ1814953-12	Carbon, Total Organic	LCS		Water	21.61 mg/L	10 ml	21.6 mg/L	1	0.07	0.50	99		10/17/18 23:31	N	IV
KQ1814953-13	Carbon, Total Organic	MB		Water	1.00000000000011E-02 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/18/18 08:36	N	IV
KQ1814953-14	Carbon, Total Organic	LCS		Water	21.37 mg/L	10 ml	21.4 mg/L	1	0.07	0.50	98		10/18/18 08:52	N	IV
KQ1814953-15	Carbon, Total Organic	MS	K1809828-001	Water	28.28 mg/L	10 ml	56.6 mg/L	2	0.2	1.0	98		10/18/18 01:07	N	IV
KQ1814953-16	Carbon, Total Organic	DUP	K1809828-001	Water	3.81 mg/L	10 ml	7.6 mg/L	2	0.2	1.0		<1	10/18/18 00:35	N	IV

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

BCD 10/18/18

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** BDITZLER **Analysis Lot:** 611322 **Method/Testcode:** SM 5310 C/TOC T

I Cod	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1814953-17	Carbon, Total Organic	DUP	K1809029-010	Water	1.93 mg/L	10 ml	1.93 mg/L	1	0.07	0.50		3	10/18/18 00:04	N	IV
Q1814953-18	Carbon, Total Organic	DUP	K1809960-001	Water	9.32 mg/L	10 ml	9.32 mg/L	1	0.07	0.50		1	10/18/18 01:39	N	IV
KQ1814953-19	Carbon, Total Organic	DUP	K1809960-002	Water	4.74 mg/L	10 ml	4.74 mg/L	1	0.07	0.50		6	10/18/18 02:11	N	IV
Q1814953-20	Carbon, Total Organic	DUP	K1809960-003	Water	2.79 mg/L	10 ml	56 mg/L	20	2	10		4	10/18/18 03:16	N	IV
KQ1814953-21	Carbon, Total Organic	DUP	K1809960-004	Water	23.31 mg/L	10 ml	23.3 mg/L	1	0.07	0.50		2	10/18/18 03:47	N	IV
Q1814953-22	Carbon, Total Organic	DUP	K1809960-005	Water	9.86 mg/L	10 ml	9.86 mg/L	1	0.07	0.50		5	10/18/18 04:19	N	IV
KQ1814953-23	Carbon, Total Organic	DUP	K1809960-006	Water	1.67 mg/L	10 ml	33 mg/L	20	2	10		2	10/18/18 04:51	N	IV
Q1814953-24	Carbon, Total Organic	MS	K1809960-007	Water	27.59 mg/L	10 ml	27.6 mg/L	1	0.07	0.50	99		10/18/18 05:55	N	IV
KQ1814953-25	Carbon, Total Organic	DUP	K1809960-007	Water	2.51 mg/L	10 ml	2.51 mg/L	1	0.07	0.50		9	10/18/18 05:23	N	IV
KQ1814953-26	Carbon, Total Organic	DUP	K1809960-008	Water	2.46 mg/L	10 ml	2.46 mg/L	1	0.07	0.50		7	10/18/18 06:27	N	IV
KQ1814953-27	Carbon, Total Organic	DUP	K1809960-009	Water	1.62 mg/L	10 ml	32 mg/L	20	2	10		6	10/18/18 06:59	N	IV
Q1814953-28	Carbon, Total Organic	DUP	K1810021-001	Water	2.34 mg/L	10 ml	47 mg/L	20	2	10		5	10/18/18 07:31	N	IV
KQ1814953-29	Carbon, Total Organic	MS	K1810021-002	Water	26.33 mg/L	10 ml	26.3 mg/L	1	0.07	0.50	88		10/18/18 09:40	N	IV
KQ1814953-30	Carbon, Total Organic	DUP	K1810021-002	Water	4.02 mg/L	10 ml	4.02 mg/L	1	0.07	0.50		8	10/18/18 09:08	N	IV
KQ1814953-31	Carbon, Total Organic	DUP	K1810021-003	Water	2.45 mg/L	10 ml	2.45 mg/L	1	0.07	0.50		6	10/18/18 10:13	N	IV
KQ1814953-32	Carbon, Total Organic	MS	K1810023-001	Water	45.22 mg/L	10 ml	45.2 mg/L	1	0.07	0.50	16*		10/18/18 11:16	N	IV
KQ1814953-33	Carbon, Total Organic	DUP	K1810023-001	Water	39.31 mg/L	10 ml	39.3 mg/L	1	0.07	0.50		5	10/18/18 10:45	N	IV
KQ1814953-34	Carbon, Total Organic	DUP	K1810100-001	Ground Water	2.84 mg/L	10 ml	2.84 mg/L	1	0.07	0.50		13*	10/18/18 11:49	N	IV
KQ1814953-35	Carbon, Total Organic	MS	K1810100-001	Ground Water	27.74 mg/L	10 ml	27.7 mg/L	1	0.07	0.50	98		10/18/18 12:54	N	IV
KQ1814953-36	Carbon, Total Organic	DUP	K1810100-002	Ground Water	1.04 mg/L	10 ml	21 mg/L	20	2	10		3	10/18/18 13:26	N	IV
KQ1814953-37	Carbon, Total Organic	DUP	K1810100-003	Ground Water	1.08 mg/L	10 ml	22 mg/L	20	2	10		8	10/18/18 13:58	N	IV

10/09/18

CES 10/19/18

10/18/18

# indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

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0.960	0.960	0.960	0.960	OBSERVATIONS	7	0.9599
0.924				STD Deviation	0.06509	BELOW
1.099				AVERAGE	1.00966	ABOVE
1.065	1.065	1.065	1.065	UCL	1.07474	1.0648
1.010	1.010	1.010	1.010	LCL	0.94457	1.0099
1.052	1.052	1.052	1.052			1.0523
0.958	0.958	0.958	0.958			0.9576
				OBSERVATIONS	5	BELOW
				STD Deviation	0.33877	BELOW
				AVERAGE	1.00890	BELOW
				UCL	1.34767	BELOW
				LCL	0.67013	BELOW
						BELOW
						BELOW
				OBSERVATIONS	5	BELOW
				STD Deviation	0.33877	BELOW
				AVERAGE	1.00890	BELOW
				UCL	1.34767	BELOW
				LCL	0.67013	BELOW
						BELOW
						BELOW
				OBSERVATIONS	5	BELOW
				STD Deviation	0.05602	BELOW
				AVERAGE	1.00890	BELOW
						BELOW
						BELOW
						BELOW
						BELOW
						BELOW

10/19/18

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TOC : 611322

Schedule: 10172018

Version: 9
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/10/17 19:01 - Wednesday

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)	4
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	K1809029-010.16	Extended Reaction 021711 (Extended Reaction 021711)	2
5	Sample	K1809828-001.01 2x	Extended Reaction 021711 (Extended Reaction 021711)	2
6	Sample	K1809828-001.01 ms 2x	Extended Reaction 021711 (Extended Reaction 021711)	1
7	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
8	Sample	K1809960-001.02	Extended Reaction 021711 (Extended Reaction 021711)	2
9	Sample	K1809960-002.01	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
10	Sample	K1809960-003.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
11	Sample	K1809960-004.01	Extended Reaction 021711 (Extended Reaction 021711)	2
12	Sample	K1809960-005.01	Extended Reaction 021711 (Extended Reaction 021711)	2
13	Sample	K1809960-006.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
14	Sample	K1809960-007.02	Extended Reaction 021711 (Extended Reaction 021711)	2
15	Sample	K1809960-007.02 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
16	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
17	Sample	K1809960-008.02	Extended Reaction 021711 (Extended Reaction 021711)	2
18	Sample	K1809960-009.02 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
19	Sample	K1810021-001.01 20x	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	K1810021-002.02	Extended Reaction 021711 (Extended Reaction 021711)	2
22	Sample	K1810021-002.02 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
23	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
24	Sample	K1810021-003.01	Extended Reaction 021711 (Extended Reaction 021711)	2
25	Sample	K1810023-001.02	Extended Reaction 021711 (Extended Reaction 021711)	2
26	Sample	K1810023-001.02 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
27	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
28	Sample	K1810100-001.05	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	K1810100-001.05 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
30	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
31	Sample	K1810100-002.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
32	Sample	K1810100-003.01 20x	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

10/19/18

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Fusion Report - 10172018
Wednesday, October 17, 2018 07:07 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/10/18 15:37 - Thursday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	10172018	Engine Version:	1.1.5.1
Instrument Name:	Fusion1	Firmware Version:	1.2.0696
Report Version:	1 of 1	Connection:	RS232 COM1
Report Creation by Operators (schedule version):	Fusion1 (Fusion1) (v9)		
Comment:			

Report Results

10/19/18

Sample Type: Clean

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/17 19:07

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	11.22	15.26	4.04	49.34	05:29
2	TC Clean	4.60	8.22	3.62	49.68	07:18
3	TC Clean	2.90	6.86	3.97	49.70	07:01
4	TC Clean	2.10	5.94	3.84	49.71	07:01

Sample Type: Clean

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/17 19:39

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.70	4.30	3.60	49.32	07:57
2	TC Clean	4.08	7.75	3.67	49.71	07:18
3	TC Clean	2.98	6.77	3.79	49.72	07:01
4	TC Clean	2.49	6.28	3.79	49.68	07:03

Sample Type: Clean

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/17 20:13

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.75	4.37	3.62	49.29	07:58
2	TC Clean	5.03	8.77	3.74	49.66	07:16
3	TC Clean	3.42	7.31	3.89	49.69	07:03
4	TC Clean	3.15	6.92	3.76	49.70	07:02

Sample Type: Blank (Creating v1163)

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/10/17 20:47

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.40	4.27	3.87	49.25	07:59
2	TC Clean	5.80	9.60	3.80	49.66	07:16
3	TC Clean	4.01	7.89	3.88	49.69	07:00
4	TC Clean	3.40	7.27	3.87	49.65	07:00
5	Reagent Blank	8.15	11.94	3.79	49.68	08:13
6	Acid Blank	1.55	5.02	3.47	49.19	08:02

Sample Type: Sample

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	1.0897 ppm	0.2033 ppm	18.6600%	2018/10/17 21:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.3926	13.9262	24.26	28.19	3.94	49.90	12:23
2	TOC	0.9590	9.5901	21.17	24.92	3.75	49.88	12:23
3	TOC	1.0149	10.1486	21.57	25.29	3.73	49.84	12:23
4	TOC	0.9921	9.9213	21.40	25.20	3.79	49.81	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

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Sample Type: Check Standard --> CCV 021711

From Schedule Version 9

	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	24.8725 ppm (PASS)	0.0000 ppm	0%	2018/10/17 22:41

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.8725	248.7252	192.57	196.27	3.70	49.83	12:34

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	50 ppmC

Sample Type: Check Standard --> CCB 021711

From Schedule Version 9

	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)	0.9599 ppm (PASS)	0.0000 ppm	0%	2018/10/17 22:58

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.9599	9.5987	22.16	26.01	3.85	49.79	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 ppmC

Sample Type: Sample

From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	1	TOC	MB1	0.9239 ppm	0.0000 ppm	0.0000%	2018/10/17 23:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9239	9.2393	20.92	24.80	3.88	49.83	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER

From Schedule Version 9

	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 [21.9 ppm]	0 / infinity (NA / NA)	22.6232 ppm (PASS)	0.0000 ppm	0%	2018/10/17 23:31

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Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	22.6232	226.2320	176.54	180.32	3.78	49.80	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	21.9 ppmC

Sample Type: Sample From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	ICS	1.4691 ppm	0.0000 ppm	0.0000%	2018/10/17 23:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4691	14.6910	24.80	28.73	3.93	49.76	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1809029-010.16	2.9650 ppm	0.0397 ppm	1.3400%	2018/10/18 00:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.9931	29.9307	35.66	39.67	4.01	49.79	12:25
2	TOC	2.9369	29.3694	35.26	39.24	3.97	49.76	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1809828-001.01 2x	4.8337 ppm	0.0142 ppm	0.2900%	2018/10/18 00:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.8437	48.4372	48.85	52.65	3.80	49.79	12:24
2	TOC	4.8237	48.2365	48.71	52.65	3.94	49.74	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1809828-001.01 ms 2x	29.2899 ppm	0.0000 ppm	0.0000%	2018/10/18 01:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	29.2899	292.8989	223.06	226.95	3.89	49.76	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TO	RB	1.2972 m	0.0000 m	0.0000%	2018/10/18 01:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2972	12.9720	23.58	27.54	3.96	49.74	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1809960-001.02	10.3992 ppm	0.0963 ppm	0.9300%	2018/10/18 01:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	10.4672	104.6723	88.93	92.87	3.94	49.74	12:21
2	TOC	10.3311	103.3112	87.96	91.80	3.84	49.76	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1809960-002.01	5.8943 ppm	0.2065 ppm	3.5000%	2018/10/18 02:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	6.0403	60.4030	57.38	61.26	3.88	49.76	12:26
2	TOC	5.7483	57.4827	55.30	59.37	4.07	49.74	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 9

	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)	25.4559 ppm (PASS)	0.0000 ppm	0%	2018/10/18 02:43

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.4559	254.5586	196.73	200.66	3.93	49.74	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	50 ppmC

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Sample Type: Check Standard --> CCB 021711 From Schedule Version 9

	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)	1.0992 ppm (PASS)	0.0000 ppm	0%	2018/10/18 02:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	1.0992	10.9922	23.16	27.20	4.04	49.74	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 ppmC

Sample Type: Sample From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1809960-003.01 20x	3.8581 ppm	0.0898 ppm	2.3300%	2018/10/18 03:16

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.9216	39.2162	42.28	46.14	3.86	49.72	12:28
2	TOC	3.7946	37.9462	41.38	45.22	3.85	49.72	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1809960-004.01	24.5450 ppm	0.3216 ppm	1.3100%	2018/10/18 03:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	24.7724	247.7244	190.87	194.79	3.92	49.70	12:24
2	TOC	24.3176	243.1764	187.63	191.36	3.74	49.72	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1809960-005.01	11.1005 ppm	0.3334 ppm	3.0000%	2018/10/18 04:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	11.3363	113.3629	95.12	98.95	3.83	49.74	12:23
2	TOC	10.8648	108.6478	91.76	95.62	3.86	49.71	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1809960-006.01 20x	2.6592 ppm	0.0210 ppm	0.7900%	2018/10/18 04:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.6444	26.4435	33.18	36.93	3.75	49.69	12:26
2	TOC	2.6741	26.7410	33.39	37.20	3.81	49.69	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1809960-007.02	3.6445 ppm	0.1708 ppm	4.6900%	2018/10/18 05:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.7653	37.6530	41.17	45.04	3.87	49.69	12:29
2	TOC	3.5238	35.2379	39.45	43.21	3.77	49.68	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	K1809960-007.02 ms	28.6021 ppm	0.0000 ppm	0.0000%	2018/10/18 05:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.6021	286.0214	218.16	222.10	3.94	49.68	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	RB	1.0050 ppm	0.0000 ppm	0.0000%	2018/10/18 06:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0050	10.0504	21.50	25.34	3.84	49.67	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	17	TOC	K1809960-008.02	3.5674 ppm	0.1329 ppm	3.7200%	2018/10/18 06:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.6613	36.6131	40.43	44.29	3.86	49.68	12:25
2	TOC	3.4734	34.7341	39.09	42.94	3.85	49.66	12:25

Dilution	Blank Contribution	Method	Calibration

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1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1809960-009.02 20x	2.5830 ppm	0.0621 ppm	2.4000%	2018/10/18 06:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.5391	25.3911	32.43	36.33	3.90	49.62	12:27
2	TOC	2.6270	26.2695	33.06	36.97	3.92	49.65	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1810021-001.01 20x	3.2860 ppm	0.0848 ppm	2.5800%	2018/10/18 07:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2260	32.2601	37.32	41.15	3.83	49.64	12:29
2	TOC	3.3460	33.4599	38.18	42.01	3.83	49.58	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 9

	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)	25.0182 ppm (PASS)	0.0000 ppm	0%	2018/10/18 08:02

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.0182	250.1818	193.61	197.45	3.85	49.67	12:33

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 9

	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)	1.0648 ppm (PASS)	0.0000 ppm	0%	2018/10/18 08:19

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time

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D	TOC	0.0 ppm	1	1.0648	10.6484	22.91	26.75	3.84	49.67	12:27

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 ppmC

Sample Type: Sample — From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	1.0099 ppm	0.0000 ppm	0.0000%	2018/10/18 08:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0099	10.0995	21.53	25.32	3.79	49.63	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER — From Schedule Version 9

	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 [21.9 ppm]	0 / infinity (NA / NA)	22.3789 ppm (PASS)	0.0000 ppm	0%	2018/10/18 08:52

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	22.3789	223.7888	174.80	178.50	3.70	49.67	12:34

Completion State	Success Action	Method	Calibration	STD Conc - Pos 2
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	21.9 ppmC

Sample Type: Sample — From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1810021-002.02	5.1891 ppm	0.2256 ppm	4.3500%	2018/10/18 09:08

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.3486	53.4862	52.45	56.30	3.85	49.68	12:26
2	TOC	5.0295	50.2951	50.18	54.18	4.00	49.82	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1810021-002.02 ms	27.3431 ppm	0.0000 ppm	0.0000%	2018/10/18 09:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.3431	273.4312	209.19	212.91	3.72	49.90	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	RB	1.1033 ppm	0.0000 ppm	0.0000%	2018/10/18 09:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.1033	11.0327	22.20	26.17	3.97	49.95	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	K1810021-003.01	3.5438 ppm	0.1162 ppm	3.2800%	2018/10/18 10:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.6259	36.2595	40.17	44.00	3.83	49.97	12:29
2	TOC	3.4616	34.6162	39.00	42.90	3.89	49.97	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1810023-001.02	41.2414 ppm	1.3101 ppm	3.1800%	2018/10/18 10:45

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	42.1678	421.6782	314.83	318.79	3.97	49.99	12:25
2	TOC	40.3151	403.1506	301.63	306.05	4.42	49.99	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	K1810023-001.02 ms	46.2330 ppm	0.0000 ppm	0.0000%	2018/10/18 11:16

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	46.2330	462.3299	343.80	348.08	4.28	49.98	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

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◈	27	TOC	RB	4.3357 ppm	0.0000 ppm	0.0000%	2018/10/18 11:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.3357	43.3573	45.23	49.57	4.34	49.97	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1810100-001.05	4.0352 ppm	0.2676 ppm	6.6300%	2018/10/18 11:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.2244	42.2445	44.44	48.45	4.01	49.95	12:26
2	TOC	3.8460	38.4598	41.74	45.67	3.92	49.93	12:20

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 9

	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)	24.7744 ppm (PASS)	0.0000 ppm	0%	2018/10/18 12:20

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.7744	247.7443	191.87	195.78	3.91	49.91	12:29

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 9

	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)	1.0523 ppm (PASS)	0.0000 ppm	0%	2018/10/18 12:37

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	1.0523	10.5235	22.82	26.64	3.82	49.96	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 ppmC

Sample Type: Sample From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1810100-001.05 ms	28.7458 ppm	0.0000 ppm	0.0000%	2018/10/18 12:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.7458	287.4584	219.18	222.94	3.75	49.93	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	RB	1.0766 ppm	0.0000 ppm	0.0000%	2018/10/18 13:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0766	10.7661	22.01	25.87	3.87	49.90	12:34

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1810100-002.01 20x	2.0339 ppm	0.0223 ppm	1.1000%	2018/10/18 13:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0181	20.1807	28.72	32.56	3.84	49.84	12:31
2	TOC	2.0496	20.4964	28.94	32.75	3.81	49.82	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	K1810100-003.01 20x	2.0473 ppm	0.0610 ppm	2.9800%	2018/10/18 13:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0042	20.0418	28.62	32.51	3.90	49.77	12:27
2	TOC	2.0905	20.9048	29.23	32.95	3.72	49.80	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.3350 (IC) (v1163)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 9

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV	0 / infinity	24.6815	0.0000	0%	2018/10/18 14:30

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					021711 [25 ppm]	(NA / NA)	ppm (PASS)	ppm		

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6815	246.8153	191.21	195.04	3.83	49.76	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos B
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	50 ppmC

Sample Type: Check Standard --> CCB 021711 From Schedule Version 9

	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)	0.9576 ppm (PASS)	0.0000 ppm	0%	2018/10/18 14:46

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.9576	9.5763	22.15	25.92	3.77	49.78	12:30

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	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
v1162	1.8893	1.4700	0.0000	0.0000	0.0000	2018/10/17 15:04	Fusion1 (Fusion1)
v1163	2.7177	1.5490	0.0000	0.0000	0.0000	2018/10/17 21:38	Fusion1 (Fusion1)

Calibrations

Name: Extended Reaction 021711 (TOC)

Version:	v17	Calibration curve formula:	TOC: y = 7.126x + 15.324
Ver Creation:	2018/03/13 21:33	r^2 value:	TOC: r^2 = 0.99994
Comment:			
Operator:	Fusion1 (Fusion1)		
Basic Analysis Type	TOC		

Basic Analysis Type: TOC

Sample ID	Y Raw Value	X Expected	Message	End Time
0.0 ppm	15.2500	0.0000		2018/03/13 19:55
0.50 ppm	18.8060	0.5000		2018/03/13 20:12
00 ppm	21.6980	1.0000		2018/03/13 20: -
5.00 ppm	50.8680	5.0000		2018/03/13 20:43
10.0 ppm	88.5720	10.0000		2018/03/13 21:00
25.0 ppm	192.2360	25.0000		2018/03/13 21:16
50.0 ppm	371.8790	50.0000		2018/03/13 21:32

Methods

Name: Extended Reaction 021711 (TOC)

Version: v3 Operator: Gen Chem Lab (Fusion1)

Ver Creation: 2013/02/04 11:44

Comment:

Parameter	Value
SampleVolume	10.0 mL
Dilution	1:10
AcidVolume	0.5 ml
ReagentVolume	2.0 ml
UVReactorPrerinse	Off
UVReactorPrerinseVolume	5.0
NumberOfUVReactorPrerinses	1
ICSpargeTime	1.00 mins
DetectorSweepFlow	500 ml/min
PreSpargeTime	4.00 mins
SystemFlow	500 ml/min

Advanced Parameter	Value
NeedleRinseVolume	5.0 ml
VialPrimeVolume	2.0 ml
ICSamplePrimeVolume	2.0 ml
ICSpargeRinseVolume	12.0 ml
BaselineStabilizeTime	0.70 min
DetectorPressureFlow	150 ml/min
SyringeSpeedWaste	10
SyringeSpeedAcid	7
SyringeSpeedReagent	7
SyringeSpeedDIWater	7
NDIRPressurization	60 psig
SyringeSpeedSampleDispense	5
SyringeSpeedSampleAspirate	4
SyringeSpeedUVDispense	7
SyringeSpeedUVAspirate	5
SyringeSpeedICDispense	7
SyringeSpeedICAspirate	5
NDIRPressureStabilize	1.75 min
SampleMixing	Off
SampleMixingCycles	1
SampleMixingVolume	10.0
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	2018/10/18 15:05

ALS Environmental

StarLIMS Run: 610600, 610601, 610602, 610627

Analysis: TOC/DOC

Method: SM 5310C/415.1/TOC T/DOC T

CCV: 11-GEN-05-70B 50 ppm LCS: 11-GEN-05-66C 24.0 ppm

ICAL Date: 3/13/18

ICAL ID: 11-GEN-05-65A

ICS ID: 11-GEN-05-66K

ICS TV: 25.0 ppm ICS % R = 1

Spike ID: 11-GEN-05-65K 0.05 ml of 5000 ppm stock ---> 10.0 ml = 25.0 ppm x dilution factor

Sodium Persulfate: 11-GEN-05-70C

21 % H3PO4: 11-GEN-05-70D

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, N11314F, Marge

FILTER ID: NA

Analyzed By:	BCD	Date Analyzed:	10/17/18
Reviewed By:	Hanyu	Date Reviewed:	10/19/18

10450 Stancliff Rd. Suite 210
Houston, TX 77099
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March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100725**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 3 sample(s) on Oct 13, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100725

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100725-01	16TB03-181011	Liquid		11-Oct-2018 08:30	13-Oct-2018 09:40	☐
HS18100725-02	16WW32-181011	GW		11-Oct-2018 09:28	13-Oct-2018 09:40	☐
HS18100725-03	16EW05-181011	GW		11-Oct-2018 11:01	13-Oct-2018 09:40	☐

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100725

CASE NARRATIVE

Work Order Comments

- Revised to updated the VOC list.
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R325772

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Sample ID: VLCSW-181018

- Ethylbenzene exceeded %recovery limits on LCS. Samples ND.

WetChemistry by Method SW9056

Batch ID: R325666

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16TB03-181011
Collection Date: 11-Oct-2018 08:30

ANALYTICAL REPORT
WorkOrder:HS18100725
Lab ID:HS18100725-01
Matrix:Liquid

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 03:50
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 03:50
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 03:50
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 03:50
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 03:50
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 03:50
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 03:50
Surr: 1,2-Dichloroethane-d4	*87.5*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 03:50*
Surr: 4-Bromofluorobenzene	*96.5*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 03:50*
Surr: Dibromofluoromethane	*95.8*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 03:50*
Surr: Toluene-d8	*93.3*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 03:50*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW32-181011
Collection Date: 11-Oct-2018 09:28

ANALYTICAL REPORT
WorkOrder:HS18100725
Lab ID:HS18100725-02
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 07:05
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:05
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:05
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:05
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 07:05
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:05
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:05
Surr: 1,2-Dichloroethane-d4	*89.7*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 07:05*
Surr: 4-Bromofluorobenzene	*96.7*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 07:05*
Surr: Dibromofluoromethane	*97.0*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 07:05*
Surr: Toluene-d8	*92.5*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 07:05*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS18100725
Sample ID:	16EW05-181011	Lab ID:HS18100725-03
Collection Date:	11-Oct-2018 11:01	Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.10**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 09:20

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325666 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** GW	
HS18100725-03	16EW05-181011	11 Oct 2018 11:01			17 Oct 2018 09:20	10
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** GW	
HS18100725-02	16WW32-181011	11 Oct 2018 09:28			19 Oct 2018 07:05	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Liquid	
HS18100725-01	16TB03-181011	11 Oct 2018 08:30			19 Oct 2018 03:50	1
Batch ID: R326322 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** GW	
HS18100725-02	16WW32-181011	11 Oct 2018 09:28			29 Oct 2018 15:58	1

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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	*44.77*	*1.0*	*50*	*0*	*89.5*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.49*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*48.4*	*1.0*	*50*	*0*	*96.8*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.29*	*1.0*	*50*	*0*	*92.6*	*81 - 120*				

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** 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	21.9	1.0	20	0	110	77 - 118				
1,1,1-Trichloroethane	20.17	1.0	20	0	101	70 - 130				
1,1,2,2-Tetrachloroethane	18.73	1.0	20	0	93.7	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.13	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.59	1.0	20	0	108	77 - 113				
1,1-Dichloroethane	20.69	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.65	1.0	20	0	103	70 - 130				
1,1-Dichloropropene	22.03	1.0	20	0	110	78 - 118				
1,2,3-Trichlorobenzene	20.23	1.0	20	0	101	70 - 130				
1,2,3-Trichloropropane	18.8	1.0	20	0	94.0	70 - 127				
1,2,4-Trichlorobenzene	21.62	1.0	20	0	108	77 - 126				
1,2,4-Trimethylbenzene	22.46	1.0	20	0	112	73 - 121				
1,2-Dibromo-3-chloropropane	17.54	1.0	20	0	87.7	70 - 130				
1,2-Dibromoethane	22.39	1.0	20	0	112	76 - 123				
1,2-Dichlorobenzene	21.11	1.0	20	0	106	77 - 113				
1,2-Dichloroethane	22.56	1.0	20	0	113	70 - 124				
1,2-Dichloropropane	22.14	1.0	20	0	111	72 - 119				
1,3,5-Trimethylbenzene	19.98	1.0	20	0	99.9	75 - 118				
1,3-Dichlorobenzene	20.97	1.0	20	0	105	78 - 118				
1,3-Dichloropropane	21.84	1.0	20	0	109	75 - 116				
1,4-Dichlorobenzene	21.68	1.0	20	0	108	79 - 113				
2,2-Dichloropropane	22.14	1.0	20	0	111	70 - 130				
2-Butanone	39.81	2.0	40	0	99.5	70 - 130				
2-Chlorotoluene	22.93	1.0	20	0	115	70 - 128				
2-Hexanone	39.54	2.0	40	0	98.9	70 - 130				
4-Chlorotoluene	22.78	1.0	20	0	114	74 - 126				
4-Isopropyltoluene	19.4	1.0	20	0	97.0	74 - 126				
4-Methyl-2-pentanone	40.5	2.0	40	0	101	70 - 130				
Acetone	40.41	2.0	40	0	101	70 - 130				
Benzene	21.64	1.0	20	0	108	74 - 120				
Bromobenzene	20.92	1.0	20	0	105	78 - 113				
Bromochloromethane	22.15	1.0	20	0	111	76 - 124				
Bromodichloromethane	22.39	1.0	20	0	112	74 - 122				
Bromoform	21.3	1.0	20	0	107	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.16	1.0	20	0	121	70 - 130				
Carbon disulfide	40.05	2.0	40	0	100	70 - 130				
Carbon tetrachloride	21.81	1.0	20	0	109	71 - 125				
Chlorobenzene	22.48	1.0	20	0	112	76 - 113				
Chloroethane	18.82	1.0	20	0	94.1	70 - 130				
Chloroform	20.57	1.0	20	0	103	71 - 121				
Chloromethane	18.22	1.0	20	0	91.1	70 - 129				
cis-1,2-Dichloroethene	21.8	1.0	20	0	109	75 - 122				
cis-1,3-Dichloropropene	23.68	1.0	20	0	118	73 - 127				
Dibromochloromethane	21.85	1.0	20	0	109	77 - 122				
Dibromomethane	22.8	1.0	20	0	114	78 - 121				
Dichlorodifluoromethane	16.02	1.0	20	0	80.1	70 - 130				
Ethylbenzene	23.45	1.0	20	0	117	77 - 117				S
Hexachlorobutadiene	20.75	1.0	20	0	104	70 - 130				
Isopropylbenzene	21.35	1.0	20	0	107	73 - 127				
m,p-Xylene	48.78	2.0	40	0	122	77 - 122				
Methylene chloride	21.65	2.0	20	0	108	70 - 127				
Naphthalene	19.4	1.0	20	0	97.0	70 - 130				
n-Butylbenzene	21.53	1.0	20	0	108	72 - 130				
n-Propylbenzene	22.93	1.0	20	0	115	73 - 124				
o-Xylene	23.76	1.0	20	0	119	75 - 119				
sec-Butylbenzene	19.62	1.0	20	0	98.1	73 - 128				
Styrene	22.74	1.0	20	0	114	72 - 126				
tert-Butylbenzene	22.15	1.0	20	0	111	73 - 124				
Tetrachloroethene	21.25	1.0	20	0	106	76 - 119				
Toluene	21.16	1.0	20	0	106	77 - 118				
trans-1,2-Dichloroethene	22.17	1.0	20	0	111	72 - 127				
trans-1,3-Dichloropropene	23.72	1.0	20	0	119	77 - 119				
Trichloroethene	23.1	1.0	20	0	115	77 - 121				
Trichlorofluoromethane	20.46	1.0	20	0	102	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.15*	*1.0*	*50*	*0*	*92.3*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.86*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.17*	*1.0*	*50*	*0*	*94.3*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.26*	*1.0*	*50*	*0*	*90.5*	*81 - 120*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** 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	19.93	1.0	20	0	99.6	70 - 120				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.64	1.0	20	0	108	70 - 130				
1,1,2-Trichloroethane	19.52	1.0	20	0	97.6	70 - 117				
1,1-Dichloroethane	19.44	1.0	20	0	97.2	70 - 127				
1,1-Dichloroethene	20.24	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	22.55	1.0	20	0	113	70 - 129				
1,2,3-Trichlorobenzene	16.48	1.0	20	0	82.4	70 - 130				
1,2,3-Trichloropropane	16.73	1.0	20	0	83.6	70 - 130				
1,2,4-Trichlorobenzene	17.65	1.0	20	0	88.3	70 - 125				
1,2,4-Trimethylbenzene	19.83	1.0	20	0	99.2	70 - 125				
1,2-Dibromo-3-chloropropane	14.87	1.0	20	0	74.4	70 - 130				
1,2-Dibromoethane	19.89	1.0	20	0	99.5	70 - 124				
1,2-Dichlorobenzene	18.74	1.0	20	0	93.7	70 - 115				
1,2-Dichloroethane	19.14	1.0	20	0	95.7	70 - 127				
1,2-Dichloropropane	20.52	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	18.38	1.0	20	0	91.9	70 - 126				
1,3-Dichlorobenzene	18.85	1.0	20	0	94.2	70 - 119				
1,3-Dichloropropane	19.64	1.0	20	0	98.2	70 - 121				
1,4-Dichlorobenzene	19.01	1.0	20	0	95.1	70 - 114				
2,2-Dichloropropane	20.09	1.0	20	0	100	70 - 130				
2-Butanone	34.38	2.0	40	0	86.0	70 - 130				
2-Chlorotoluene	20.71	1.0	20	0	104	70 - 130				
2-Hexanone	34.15	2.0	40	0	85.4	70 - 130				
4-Chlorotoluene	20.55	1.0	20	0	103	70 - 130				
4-Isopropyltoluene	17.83	1.0	20	0	89.2	70 - 130				
4-Methyl-2-pentanone	36.27	2.0	40	0	90.7	70 - 130				
Acetone	35.8	2.0	40	0	89.5	70 - 130				
Benzene	20.48	1.0	20	0	102	70 - 127				
Bromobenzene	19.06	1.0	20	0	95.3	70 - 115				
Bromochloromethane	19.62	1.0	20	0	98.1	70 - 127				
Bromodichloromethane	20.37	1.0	20	0	102	70 - 124				
Bromoform	18.57	1.0	20	0	92.9	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.12	1.0	20	0	116	70 - 130				
Carbon disulfide	39.49	2.0	40	0	98.7	70 - 130				
Carbon tetrachloride	21.31	1.0	20	0	107	70 - 130				
Chlorobenzene	20.51	1.0	20	0	103	70 - 114				
Chloroethane	19.96	1.0	20	0	99.8	70 - 130				
Chloroform	18.95	1.0	20	0	94.7	70 - 125				
Chloromethane	16.31	1.0	20	0	81.5	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	21.1	1.0	20	0	106	70 - 125				
Dibromochloromethane	19.32	1.0	20	0	96.6	70 - 124				
Dibromomethane	20.47	1.0	20	0	102	70 - 124				
Dichlorodifluoromethane	16.46	1.0	20	0	82.3	70 - 130				
Ethylbenzene	22.32	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	18.59	1.0	20	0	92.9	70 - 130				
Isopropylbenzene	19.83	1.0	20	0	99.2	70 - 130				
m,p-Xylene	44.08	2.0	40	0	110	70 - 130				
Methylene chloride	19.79	2.0	20	0	99.0	70 - 128				
Naphthalene	14.85	1.0	20	0	74.2	70 - 130				
n-Butylbenzene	19.62	1.0	20	0	98.1	70 - 130				
n-Propylbenzene	21.13	1.0	20	0	106	70 - 130				
o-Xylene	21.69	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.74	1.0	20	0	93.7	70 - 130				
Styrene	19.72	1.0	20	0	98.6	70 - 130				
tert-Butylbenzene	20.67	1.0	20	0	103	70 - 130				
Tetrachloroethene	20.42	1.0	20	0	102	70 - 130				
Toluene	20.05	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	20.57	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	21.52	1.0	20	0	108	70 - 121				
Trichloroethene	21.28	1.0	20	0	106	70 - 129				
Trichlorofluoromethane	21.09	1.0	20	0	105	70 - 130				
Vinyl chloride	20.12	1.0	20	0	101	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.12*	*1.0*	*50*	*0*	*94.2*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.83*	*1.0*	*50*	*0*	*104*	*81 - 113*				
Surr: Dibromofluoromethane	*47.28*	*1.0*	*50*	*0*	*94.6*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** 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	19.67	1.0	20	0	98.3	70 - 120	19.93	1.3	20	
1,1,1-Trichloroethane	18.24	1.0	20	0	91.2	70 - 130	19.47	6.49	20	
1,1,2,2-Tetrachloroethane	15.89	1.0	20	0	79.5	70 - 123	16.62	4.49	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	19.82	1.0	20	0	99.1	70 - 130	21.64	8.76	20	
1,1,2-Trichloroethane	19.13	1.0	20	0	95.7	70 - 117	19.52	2	20	
1,1-Dichloroethane	18.24	1.0	20	0	91.2	70 - 127	19.44	6.36	20	
1,1-Dichloroethene	18.81	1.0	20	0	94.0	70 - 130	20.24	7.34	20	
1,1-Dichloropropene	20.91	1.0	20	0	105	70 - 129	22.55	7.55	20	
1,2,3-Trichlorobenzene	16.77	1.0	20	0	83.8	70 - 130	16.48	1.73	20	
1,2,3-Trichloropropane	16.43	1.0	20	0	82.1	70 - 130	16.73	1.82	20	
1,2,4-Trichlorobenzene	17.98	1.0	20	0	89.9	70 - 125	17.65	1.85	20	
1,2,4-Trimethylbenzene	19.53	1.0	20	0	97.7	70 - 125	19.83	1.53	20	
1,2-Dibromo-3-chloropropane	14.25	1.0	20	0	71.3	70 - 130	14.87	4.25	20	
1,2-Dibromoethane	19.34	1.0	20	0	96.7	70 - 124	19.89	2.81	20	
1,2-Dichlorobenzene	18.24	1.0	20	0	91.2	70 - 115	18.74	2.71	20	
1,2-Dichloroethane	19.32	1.0	20	0	96.6	70 - 127	19.14	0.916	20	
1,2-Dichloropropane	20.11	1.0	20	0	101	70 - 122	20.52	1.99	20	
1,3,5-Trimethylbenzene	17.6	1.0	20	0	88.0	70 - 126	18.38	4.3	20	
1,3-Dichlorobenzene	18.73	1.0	20	0	93.6	70 - 119	18.85	0.636	20	
1,3-Dichloropropane	18.95	1.0	20	0	94.7	70 - 121	19.64	3.62	20	
1,4-Dichlorobenzene	18.82	1.0	20	0	94.1	70 - 114	19.01	1.04	20	
2,2-Dichloropropane	18.81	1.0	20	0	94.0	70 - 130	20.09	6.58	20	
2-Butanone	34.35	2.0	40	0	85.9	70 - 130	34.38	0.0911	20	
2-Chlorotoluene	19.91	1.0	20	0	99.6	70 - 130	20.71	3.92	20	
2-Hexanone	34.65	2.0	40	0	86.6	70 - 130	34.15	1.46	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.55	2.26	20	
4-Isopropyltoluene	17.1	1.0	20	0	85.5	70 - 130	17.83	4.21	20	
4-Methyl-2-pentanone	35.68	2.0	40	0	89.2	70 - 130	36.27	1.63	20	
Acetone	32.18	2.0	40	0	80.4	70 - 130	35.8	10.7	20	
Benzene	19.68	1.0	20	0	98.4	70 - 127	20.48	3.98	20	
Bromobenzene	18.59	1.0	20	0	93.0	70 - 115	19.06	2.49	20	
Bromochloromethane	19.83	1.0	20	0	99.1	70 - 127	19.62	1.07	20	
Bromodichloromethane	19.79	1.0	20	0	98.9	70 - 124	20.37	2.89	20	
Bromoform	18.27	1.0	20	0	91.3	70 - 129	18.57	1.65	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.98	1.0	20	0	105	70 - 130	23.12	9.72	20	
Carbon disulfide	36.19	2.0	40	0	90.5	70 - 130	39.49	8.72	20	
Carbon tetrachloride	20.74	1.0	20	0	104	70 - 130	21.31	2.73	20	
Chlorobenzene	19.53	1.0	20	0	97.6	70 - 114	20.51	4.92	20	
Chloroethane	18.48	1.0	20	0	92.4	70 - 130	19.96	7.72	20	
Chloroform	18.47	1.0	20	0	92.4	70 - 125	18.95	2.55	20	
Chloromethane	15.83	1.0	20	0	79.1	70 - 130	16.31	3.01	20	
cis-1,2-Dichloroethene	19.71	1.0	20	0	98.5	70 - 128	20.24	2.69	20	
cis-1,3-Dichloropropene	20.74	1.0	20	0	104	70 - 125	21.1	1.73	20	
Dibromochloromethane	18.89	1.0	20	0	94.5	70 - 124	19.32	2.25	20	
Dibromomethane	20.01	1.0	20	0	100	70 - 124	20.47	2.29	20	
Dichlorodifluoromethane	14.34	1.0	20	0	71.7	70 - 130	16.46	13.8	20	
Ethylbenzene	20.91	1.0	20	0	105	70 - 124	22.32	6.53	20	
Hexachlorobutadiene	17.83	1.0	20	0	89.2	70 - 130	18.59	4.17	20	
Isopropylbenzene	18.68	1.0	20	0	93.4	70 - 130	19.83	5.99	20	
m,p-Xylene	41.93	2.0	40	0	105	70 - 130	44.08	5	20	
Methylene chloride	19.21	2.0	20	0	96.1	70 - 128	19.79	2.98	20	
Naphthalene	15.43	1.0	20	0	77.2	70 - 130	14.85	3.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.62	3.74	20	
n-Propylbenzene	19.91	1.0	20	0	99.6	70 - 130	21.13	5.92	20	
o-Xylene	20.75	1.0	20	0	104	70 - 124	21.69	4.43	20	
sec-Butylbenzene	17.69	1.0	20	0	88.5	70 - 130	18.74	5.72	20	
Styrene	19.17	1.0	20	0	95.8	70 - 130	19.72	2.83	20	
tert-Butylbenzene	19.41	1.0	20	0	97.1	70 - 130	20.67	6.26	20	
Tetrachloroethene	19.01	1.0	20	0	95.0	70 - 130	20.42	7.18	20	
Toluene	18.86	1.0	20	0	94.3	70 - 123	20.05	6.11	20	
trans-1,2-Dichloroethene	19.55	1.0	20	0	97.8	70 - 130	20.57	5.06	20	
trans-1,3-Dichloropropene	21.15	1.0	20	0	106	70 - 121	21.52	1.72	20	
Trichloroethene	20.09	1.0	20	0	100	70 - 129	21.28	5.75	20	
Trichlorofluoromethane	19.62	1.0	20	0	98.1	70 - 130	21.09	7.23	20	
Vinyl chloride	18.52	1.0	20	0	92.6	70 - 130	20.12	8.3	20	
Surr: 1,2-Dichloroethane-d4	*46.4*	*1.0*	*50*	*0*	*92.8*	*70 - 126*	*47.12*	*1.54*	*20*	
Surr: 4-Bromofluorobenzene	*50.76*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.83*	*2.1*	*20*	
Surr: Dibromofluoromethane	*46.93*	*1.0*	*50*	*0*	*93.9*	*77 - 123*	*47.28*	*0.751*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*	*44.83*	*0.00577*	*20*	

The following samples were analyzed in this batch: HS18100725-01 HS18100725-02

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100725

QC BATCH REPORT

Batch ID: R325666 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:03**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777661** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U

LCS Sample ID: **WLCSW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:18**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777662** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.648	0.100	4	0	91.2	80 - 120				

LCSD Sample ID: **WLCSDW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:32**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777663** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.65	0.100	4	0	91.2	80 - 120	3.648	0.0548	20	

MS Sample ID: **HS18100727-05MS** Units: **mg/L** Analysis Date: **17-Oct-2018 08:22**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777687** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.55	1.00	20	5.566	89.9	80 - 120				

MSD Sample ID: **HS18100727-05MSD** Units: **mg/L** Analysis Date: **17-Oct-2018 08:36**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777688** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.94	1.00	20	5.566	91.8	80 - 120	23.55	1.62	20	

The following samples were analyzed in this batch: HS18100725-03

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS18100725**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100725

Date/Time Received: **13-Oct-2018 09:40**
Received by: **PJM**

Checklist completed by: *Pablo Marinez* eSignature 13-Oct-2018 Date

Reviewed by: *RJ Modashia* eSignature 15-Oct-2018 Date

Matrices: **WATER**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.3C/1.0C UC/C	IR # 25
Cooler(s)/Kit(s):	44084	
Date/Time sample(s) sent to storage:	10/13/2018 17:00	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181011 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-50			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060				
16TB03-181011	FIELD QC				LIQ	10/11/2018	830	2		2									
16WW32-181011	16WW32	31.58	32.24	FT	GW	10/11/2018	928	4		3	1								
16EW05-181011	16EW05	28.58	29.06	FT	GW	10/11/2018	1101	1					1						

HS18100725

Aptim Environmental & Infrastucture, Inc.

Longhorn Army Ammunition Plant

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	APTM	10/12/18 10	ALS PM	10-13-18 9:40

44084 VC 1.3C IR 25 CF -03

CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

FedEx
TRK# 0221 4380 9533 1366
SATURDAY 12:00P
PRIORITY OVERNIGHT
XO SGRA
77099
TX-US IAH

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828987; 1828988; 1828989; 1829115

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2159 (225647)

General Set Information: There were eighteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly.

Method QC data: The method blank (LMB 624449) was less than 1/2 the CRDL. The recovery for the LCS (624450) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected. The relative percent differences (RPD's) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 25, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 29, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1828987**
Project ID: HS18100725 101118
Purchase Order: HS18100725
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW32-181011	1828987001	10/11/18	10/16/18	

ANALYTICAL REPORT

Workorder: 34-1828987
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID:	16WW32-181011	Sampling Site:	NA	Collected:	10/11/2018
Lab ID:	1828987001	Media:	125 mL Nalgene	Received:	10/16/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation:	Not Applicable	**Analysis:**	EPA 6850, DoD QSM Water	**Instrument ID:**	LCMS04
		Batch:	ELMS/2159 (HBN: 225647)	**Percent Solid:**	NA
		Analyzed:	10/24/2018 09:25	**Report Basis:**	Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/25/2018 14:54	/S/ Stephen Brose 10/29/2018 08:45

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

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ANALYTICAL REPORT

Workorder: 34-1828987
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1828987

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2159 (HBN: 225647)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Blank

LMB: 624449
Analyzed: 10/24/2018 08:55
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 624450
Analyzed: 10/24/2018 09:09
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.90	5.00	97.9	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828988001		MS: 1828988002					MSD: 1828988003				
Analyzed: 10/24/2018 09:40		Analyzed: 10/24/2018 09:54					Analyzed: 10/24/2018 10:08				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	4.75	5	94.9	78.8	123.8	4.67	93.3	1.7	0.0	20.0

Sample: 1828989004		MS: 1828989005					MSD: 1828989006				
Analyzed: 10/24/2018 11:47		Analyzed: 10/24/2018 12:29					Analyzed: 10/24/2018 12:43				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	5.4	5	108	78.8	123.8	6.26	# 125	14.7	0.0	20.0

Continuing Calibration Verification

CCV: 624446				CCV: 624451			CCV: 624453		
Analyzed: 10/24/2018 08:12				Analyzed: 10/24/2018 12:01			Analyzed: 10/24/2018 15:06		
Units: ug/L				Units: ug/L			Units: ug/L		
Criteria: ± 15%				Criteria: ± 15%			Criteria: ± 15%		
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	24.4	25.0	97.6	23.5	25.0	94.0	23.5	25.0	94.2

Interference Check Sample

ICSA: 624448
Analyzed: 10/24/2018 08:41
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	0.985	1.00	98.5

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1828987**

Limits: Client SOW/Contract Specified
Basis: DoD QSM

Preparation: NA
Batch: NA
Prepared By: NA

Analysis: EPA 6850, DoD QSM
Batch: ELMS/2159 (HBN: 225647)
Analyzed By: Thomas Bosch

Limit of Detection Verification

LODV: 624447 **Analyzed:** 10/24/2018 08:27 **Units:** ug/L **Criteria:** ± 50%				**LODV:** 624452 **Analyzed:** 10/24/2018 12:15 **Units:** ug/L **Criteria:** ± 50%			**LODV:** 624454 **Analyzed:** 10/24/2018 15:20 **Units:** ug/L **Criteria:** ± 50%		
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	1.03	1.00	103	0.970	1.00	97.0	1.02	1.00	102

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch 10/25/2018 14:54	/S/ Stephen Brose 10/29/2018 08:45

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ● - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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W 1828987

18698/#2

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: 10011

1828987

SUBCONTRACT TO:

ALS Laboratory Group
960 West LeVoy Drive
Salt Lake City, UT 84123

Phone: +1 800 356 9135

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:	HS18100725
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100725-02**	**16WW32-181011**	**GW**	**11 Oct 2018 09:28**
	SUB_Perch-6850			23 Oct 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: 10/15/18 1800

Received By: Deshuntell Date/Time: 10/16/18 10:20

Cooler ID(s): _____ Temperature(s): _____

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100725	Split:	Workorder ID: 1828987	Level: ENV_LVL4	Requested Analysis
Client: ALS Environmental (Houston)		Account: 8101	Type: 125Poly	
Comments:			Preservatives: COOL	
			Containers: ID(s) / Count	

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	ID(s)	Count	EPA 6850, DoD QSM
1	10/11/2018 09:28	16WW32-181011	1828987001		Water	A	1	A
2								
3								
4								
5								
6								
7								
8								
9								
10								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/16/2018 10:20	ALS Sample Receiving	Sample Login
Julie Warath	10/17/18 1000	3C	Storage
R.33.1	10.23.18/14:10	T. Bosch	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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10/16/18

ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

1818182887

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: HS18100725/10011

Date/Time of Receipt: 10/16/2018 10:20

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8831	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Desinee Hill (Signature) Desinee Hill (Printed Name) 10/16/2018 (Date)

CLIENT-RELATED INFORMATION

☐ Missing Cooler	☐ Missing Samples/Bottles	☐ Incorrect Preservation	☐ Insufficient Sample Volume
☐ Cooler Conditions	☐ Broken/Leaking Samples	☐ pH Criteria Not Met	☐ Chain of Custody Problems
☐ Missing Paperwork	☐ Incorrect Bottle Type	☐ Residual Chlorine Present	☐ Other:
☐ Missing/Incorrect Bottle Labels	☐ Cooler Temperatures Out of Range	☐ Head Space in Bottles	

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ No ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Part# 159669-434 RIT2 EXP 07/18 ss

Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 15OCT18
ACTWGT: 22.55 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18100725/726/727 - RJ

FedEx Express

TRK# 0201 **4380 9533 6070**

TUE - 16 OCT 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

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Batch Worklist

Batch: ELMS/ 2159 **Created:** 10/23/2018 18:03 **Instrument:** **HBN:** 225647

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828987 [ENV_LVL4]
Workorder: 1828988 [ENV_LVL4]
Workorder: 1828989 [ENV_LVL4]
Workorder: 1829115 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	624446	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
2	624447	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
3	624448	ICS for HBN 225647 [ELMS/2159]				ICS	3		E6850..D3Q	5311		10/29/2018	
4	624449	LMB for HBN 225647 [ELMS/2159]				LMB	3		E6850Q413Q	5311		10/29/2018	
5	624450	LCS for HBN 225647 [ELMS/2159]				LCS	3		E6850Q413Q	5311		10/29/2018	
6	1828987001	16WW32-181011				SAMPLE	3	1828987001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
7	1828988001	16SW01-181011				SAMPLE	3	1828988001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
8	1828988002	16SW01-181011MS				MS	3	1828988002-A	E6850Q413Q	5480		10/29/2018	
9	1828988003	16SW01-181011MSD				MSD	3	1828988003-A	E6850Q413Q	5480		10/29/2018	
10	1828988004	16SW01-181011-FD				FLDDUP	3	1828988004-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
11	1828988005	16SW02-181011				SAMPLE	3	1828988005-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
12	1828988006	16SW03-181011				SAMPLE	3	1828988006-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
13	1828989001	16WW30-181012				SAMPLE	3	1828989001-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
14	1828989002	16WW46-181012				SAMPLE	3	1828989002-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
15	1828989003	16WW23-181012				SAMPLE	3	1828989003-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
16	1828989004	16WW40-181012				SAMPLE	3	1828989004-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
17	624451	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
18	624452	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
19	1828989005	16WW40-181012MS				MS	3	1828989005-A	E6850Q413Q	5480		10/29/2018	
20	1828989006	16WW40-181012MSD				MSD	3	1828989006-A	E6850Q413Q	5480		10/29/2018	
21	1828989007	16WW40-181012-FD				FLDDUP	3	1828989007-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
22	1828989008	16WW27-181012				SAMPLE	3	1828989008-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
23	1828989009	16WW12-181012				SAMPLE	3	1828989009-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
24	1828989010	16WW42-181012				SAMPLE	3	1828989010-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
25	1828989011	16WW13-181012				SAMPLE	3	1828989011-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
26	1828989012	16WW21-181012				SAMPLE	3	1828989012-A	E6850Q41.3	5480	11/9/2018	10/29/2018	

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Batch Worklist

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
27	1828989013	16EB01-181012				EQBK	3	1828989013-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
28	1829115001	16WW29-181015				SAMPLE	3	1829115001-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
29	1829115002	16WW55-181015				SAMPLE	3	1829115002-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
30	624453	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
31	624454	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828987 (001); 1828988 (001-06); 1828989 (001-13); 1829115 (001,02)
ELMS Batch/HBN ID: 2159 (225647)
Prep Date: 10/23/2018 Analysis Date: 10/24/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\24OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 624450; Target = 5.0µg/L. ASTM type II water was used for LMB 624449.

MS/MSD: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:

1) Results reported in µg/L. Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly. Samples 1828989004/07 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters, except for the following. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225647-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS 2159 HBN 225647 **Sample Set IDs if Applicable:** 18-28987/18289881/18289889/1829115	**Analyst Initials**	**Reviewer Initials**
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

T.B. 10.26.18
SB 10/29/18

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ALS

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard:	43659	**Created By:**	Thomas Bosch	**Amount:**	100 mL
MFG:	AccuStandard	**Create Date:**	09/17/2018 09:09AM	**Expires:**	07/25/2020
MFG Lot:	218065075			**Usable:**	No
Part ID:	IC-PER-10X-1			**Lab Lot:**	CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O			Description - ASTM Type II Water
Standard: 109	**Created By:** ALS Support (Lims)		**Amount:** 1000 L
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM		**Expires:** 11/07/2025
MFG Lot: Not Provided			**Usable:** Yes
Part ID: Not Provided			**Lab Lot:** LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK		Description - 6850 QC Stock STD 1,000ug/mL
Standard: 36748	Created By: Thomas Bosch	Amount: 100 mL
MFG: Ultra Scientific	Create Date: 05/11/2017 01:05PM	Expires: 03/31/2020
MFG Lot: CP-0860		Usable: Yes
Part ID: ICC-013		Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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ALS

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK		Description - Perchlorate ISTD Wrk 1,000ug/L
Standard: 43730	**Created By:** Thomas Bosch	**Amount:** 25 mL
MFG: ALS/SLC	**Create Date:** 09/20/2018 09:09AM	**Expires:** 09/20/2019
MFG Lot: TNB: 05/09/2018	**Verified By:** Thomas Bosch	**Usable:** Yes
Pipette ID: Not Provided	**Verify Date:**	**Lab Lot:** CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER
ANAB ACCREDITED TESTING LABORATORY

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

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125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

GHS

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

** For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100726**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 5 sample(s) on Oct 13, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100726

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100726-01	16TB04-181011	Liquid	VBLKW-092618-18	11-Oct-2018 13:00	13-Oct-2018 09:40	☐
HS18100726-02	16SW01-181011	Surface Water		11-Oct-2018 13:55	13-Oct-2018 09:40	☐
HS18100726-03	16SW01-181011-FD	Surface Water		11-Oct-2018 13:55	13-Oct-2018 09:40	☐
HS18100726-04	16SW02-181011	Surface Water		11-Oct-2018 15:10	13-Oct-2018 09:40	☐
HS18100726-05	16SW03-181011	Surface Water		11-Oct-2018 16:30	13-Oct-2018 09:40	☐

Revision:2

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100726

CASE NARRATIVE

Work Order Comments

- Revised to updated the VOC list.
- 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.

Work Order Comments

- Revised to add the the correct Perchlorate Data Package

  The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. 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: R325772

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Sample ID: VLCSW-181018

- Ethylbenzene exceeded %recovery limits on LCS. Samples ND.

Metals by Method SW6020

Batch ID: 133599

Sample ID: 16SW01-181011 (HS18100726-02MS)

- The MS recovery was outside of the control; however, the result in the parent sample is greater than 4x the spike amount. Manganese

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16TB04-181011
Collection Date: 11-Oct-2018 13:00

ANALYTICAL REPORT
WorkOrder:HS18100726
Lab ID:HS18100726-01
Matrix:Liquid

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 04:14
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:14
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:14
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:14
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 04:14
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:14
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:14
Surr: 1,2-Dichloroethane-d4	*89.8*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 04:14*
Surr: 4-Bromofluorobenzene	*96.9*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 04:14*
Surr: Dibromofluoromethane	*96.4*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 04:14*
Surr: Toluene-d8	*92.2*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 04:14*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16SW01-181011
Collection Date: 11-Oct-2018 13:55

ANALYTICAL REPORT
WorkOrder:HS18100726
Lab ID:HS18100726-02
Matrix:Surface Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 05:03
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 05:03
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 05:03
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 05:03
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 05:03
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 05:03
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 05:03
Surr: 1,2-Dichloroethane-d4	*90.7*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 05:03*
Surr: 4-Bromofluorobenzene	*96.5*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 05:03*
Surr: Dibromofluoromethane	*95.4*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 05:03*
Surr: Toluene-d8	*92.1*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 05:03*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 16-Oct-2018		Analyst: ALR
Arsenic	**0.00204**		**0.000400**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:24
Chromium	**0.000499**	J	**0.000400**	**0.00100**	**0.00400**	**mg/L**	1	24-Oct-2018 17:24
Manganese	**0.545**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	24-Oct-2018 17:24
Nickel	**0.00756**		**0.000600**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:24
Thallium	**0.000418**	J	**0.000200**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:24
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16SW01-181011-FD
Collection Date: 11-Oct-2018 13:55

ANALYTICAL REPORT
WorkOrder:HS18100726
Lab ID:HS18100726-03
Matrix:Surface Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 07:30
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:30
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:30
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:30
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 07:30
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:30
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:30
Surr: 1,2-Dichloroethane-d4	*90.6*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 07:30*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 07:30*
Surr: Dibromofluoromethane	*97.4*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 07:30*
Surr: Toluene-d8	*92.2*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 07:30*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 16-Oct-2018		Analyst: ALR
Arsenic	**0.00212**		**0.000400**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:34
Chromium	**0.000515**	J	**0.000400**	**0.00100**	**0.00400**	**mg/L**	1	24-Oct-2018 17:34
Manganese	**0.586**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	24-Oct-2018 17:34
Nickel	**0.00786**		**0.000600**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:34
Thallium	0.00100	U	0.000200	0.00100	0.00200	mg/L	1	24-Oct-2018 17:34
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16SW02-181011
Collection Date: 11-Oct-2018 15:10

ANALYTICAL REPORT
WorkOrder:HS18100726
Lab ID:HS18100726-04
Matrix:Surface Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 07:54
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:54
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:54
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:54
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 07:54
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:54
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 07:54
Surr: 1,2-Dichloroethane-d4	*91.3*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 07:54*
Surr: 4-Bromofluorobenzene	*99.1*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 07:54*
Surr: Dibromofluoromethane	*98.1*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 07:54*
Surr: Toluene-d8	*94.2*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 07:54*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 16-Oct-2018		Analyst: ALR
Arsenic	**0.00198**	J	**0.000400**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:36
Chromium	0.00100	U	0.000400	0.00100	0.00400	mg/L	1	24-Oct-2018 17:36
Manganese	**0.485**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	24-Oct-2018 17:36
Nickel	**0.00725**		**0.000600**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:36
Thallium	0.00100	U	0.000200	0.00100	0.00200	mg/L	1	24-Oct-2018 17:36
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16SW03-181011
Collection Date: 11-Oct-2018 16:30

ANALYTICAL REPORT
WorkOrder:HS18100726
Lab ID:HS18100726-05
Matrix:Surface Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 08:19
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:19
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:19
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:19
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 08:19
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:19
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:19
Surr: 1,2-Dichloroethane-d4	*90.2*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 08:19*
Surr: 4-Bromofluorobenzene	*97.9*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 08:19*
Surr: Dibromofluoromethane	*97.0*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 08:19*
Surr: Toluene-d8	*92.3*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 08:19*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 16-Oct-2018		Analyst: ALR
Arsenic	**0.00194**	J	**0.000400**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:42
Chromium	0.00100	U	0.000400	0.00100	0.00400	mg/L	1	24-Oct-2018 17:42
Manganese	**0.360**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	24-Oct-2018 17:42
Nickel	**0.00668**		**0.000600**	**0.00100**	**0.00200**	**mg/L**	1	24-Oct-2018 17:42
Thallium	0.00100	U	0.000200	0.00100	0.00200	mg/L	1	24-Oct-2018 17:42
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 2

RIGHT SOLUTIONS | RIGHT PARTNER

Weight / Prep Log

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

Batch ID: 133599 **Start Date:** 16 Oct 2018 14:00 **End Date:** 16 Oct 2018 18:00
Method: WATER - SW3010A **Prep Code:** 3010A

Sample ID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18100726-02		10 (mL)	10 (mL)	1
HS18100726-03		10 (mL)	10 (mL)	1
HS18100726-04		10 (mL)	10 (mL)	1
HS18100726-05		10 (mL)	10 (mL)	1

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: 133599 (0)	**Test Name :** ICP-MS METALS BY SW6020A				**Matrix:** Surface Water	
HS18100726-02	16SW01-181011	11 Oct 2018 13:55		16 Oct 2018 14:00	24 Oct 2018 17:24	1
HS18100726-03	16SW01-181011-FD	11 Oct 2018 13:55		16 Oct 2018 14:00	24 Oct 2018 17:34	1
HS18100726-04	16SW02-181011	11 Oct 2018 15:10		16 Oct 2018 14:00	24 Oct 2018 17:36	1
HS18100726-05	16SW03-181011	11 Oct 2018 16:30		16 Oct 2018 14:00	24 Oct 2018 17:42	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Surface Water	
HS18100726-02	16SW01-181011	11 Oct 2018 13:55			19 Oct 2018 05:03	1
HS18100726-03	16SW01-181011-FD	11 Oct 2018 13:55			19 Oct 2018 07:30	1
HS18100726-04	16SW02-181011	11 Oct 2018 15:10			19 Oct 2018 07:54	1
HS18100726-05	16SW03-181011	11 Oct 2018 16:30			19 Oct 2018 08:19	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Liquid	
HS18100726-01	16TB04-181011	11 Oct 2018 13:00			19 Oct 2018 04:14	1
Batch ID: R326322 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Surface Water	
HS18100726-02	16SW01-181011	11 Oct 2018 13:55			29 Oct 2018 15:58	1
HS18100726-03	16SW01-181011-FD	11 Oct 2018 13:55			29 Oct 2018 15:58	1
HS18100726-04	16SW02-181011	11 Oct 2018 15:10			29 Oct 2018 15:58	1
HS18100726-05	16SW03-181011	11 Oct 2018 16:30			29 Oct 2018 15:58	1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: 133599 (0) **Instrument:** ICPMS05 **Method:** ICP-MS METALS BY SW6020A

MBLK Sample ID: **MBLK-133599** Units: **mg/L** Analysis Date: **24-Oct-2018 17:20**
Client ID: Run ID: **ICPMS05_326035** SeqNo: **4788130** PrepDate: **16-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.00100	0.00200								U
Chromium	0.00100	0.00400								U
Manganese	0.002255	0.00500								J
Nickel	0.00100	0.00200								U
Thallium	0.00100	0.00200								U

LCS Sample ID: **LCS-133599** Units: **mg/L** Analysis Date: **24-Oct-2018 17:22**
Client ID: Run ID: **ICPMS05_326035** SeqNo: **4788131** PrepDate: **16-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.04537	0.00200	0.05	0	90.7	80 - 120				
Chromium	0.04643	0.00400	0.05	0	92.9	80 - 120				
Manganese	0.04849	0.00500	0.05	0	97.0	80 - 120				
Nickel	0.04682	0.00200	0.05	0	93.6	80 - 120				
Thallium	0.0458	0.00200	0.05	0	91.6	80 - 120				

MS Sample ID: **HS18100726-02MS** Units: **mg/L** Analysis Date: **24-Oct-2018 17:28**
Client ID: **16SW01-181011** Run ID: **ICPMS05_326035** SeqNo: **4788134** PrepDate: **16-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.048	0.00200	0.05	0.002043	91.9	80 - 120				
Chromium	0.0471	0.00400	0.05	0.000499	93.2	80 - 120				
Manganese	0.5837	0.00500	0.05	0.545	77.3	80 - 120				SO
Nickel	0.05435	0.00200	0.05	0.007556	93.6	80 - 120				
Thallium	0.04694	0.00200	0.05	0.000418	93.0	80 - 120				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: 133599 (0) **Instrument:** ICPMS05 **Method:** ICP-MS METALS BY SW6020A

MSD Sample ID: **HS18100726-02MSD** Units: **mg/L** Analysis Date: **24-Oct-2018 17:30**
Client ID: **16SW01-181011** Run ID: **ICPMS05_326035** SeqNo: **4788135** PrepDate: **16-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.04767	0.00200	0.05	0.002043	91.3	80 - 120	0.048	0.684	20	
Chromium	0.04732	0.00400	0.05	0.000499	93.6	80 - 120	0.0471	0.466	20	
Manganese	0.5968	0.00500	0.05	0.545	104	80 - 120	0.5837	2.22	20	O
Nickel	0.05352	0.00200	0.05	0.007556	91.9	80 - 120	0.05435	1.53	20	
Thallium	0.04671	0.00200	0.05	0.000418	92.6	80 - 120	0.04694	0.502	20	

PDS Sample ID: **HS18100726-02PDS** Units: **mg/L** Analysis Date: **24-Oct-2018 17:32**
Client ID: **16SW01-181011** Run ID: **ICPMS05_326035** SeqNo: **4788136** PrepDate: **16-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.09579	0.00200	0.1	0.002043	93.8	75 - 125				
Chromium	0.09506	0.00400	0.1	0.000499	94.6	75 - 125				
Manganese	0.6447	0.00500	0.1	0.545	99.6	75 - 125				O
Nickel	0.1027	0.00200	0.1	0.007556	95.2	75 - 125				
Thallium	0.1006	0.00200	0.1	0.000418	100	75 - 125				

SD Sample ID: **HS18100726-02SD** Units: **mg/L** Analysis Date: **24-Oct-2018 17:26**
Client ID: **16SW01-181011** Run ID: **ICPMS05_326035** SeqNo: **4788133** PrepDate: **16-Oct-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Arsenic	0.002165	0.0100					0.002043	0	10	J
Chromium	0.00500	0.0200					0.000499	0	10	U
Manganese	0.5552	0.0250					0.545	1.87	10	
Nickel	0.006768	0.0100					0.007556	0	10	J
Thallium	0.00500	0.0100					0.000418	0	10	U

The following samples were analyzed in this batch: HS18100726-02 HS18100726-03 HS18100726-04 HS18100726-05

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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	*44.77*	*1.0*	*50*	*0*	*89.5*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.49*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*48.4*	*1.0*	*50*	*0*	*96.8*	*73 - 126*				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.29*	*1.0*	*50*	*0*	*92.6*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** 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	21.9	1.0	20	0	110	77 - 118				
1,1,1-Trichloroethane	20.17	1.0	20	0	101	70 - 130				
1,1,2,2-Tetrachloroethane	18.73	1.0	20	0	93.7	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.13	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.59	1.0	20	0	108	77 - 113				
1,1-Dichloroethane	20.69	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.65	1.0	20	0	103	70 - 130				
1,1-Dichloropropene	22.03	1.0	20	0	110	78 - 118				
1,2,3-Trichlorobenzene	20.23	1.0	20	0	101	70 - 130				
1,2,3-Trichloropropane	18.8	1.0	20	0	94.0	70 - 127				
1,2,4-Trichlorobenzene	21.62	1.0	20	0	108	77 - 126				
1,2,4-Trimethylbenzene	22.46	1.0	20	0	112	73 - 121				
1,2-Dibromo-3-chloropropane	17.54	1.0	20	0	87.7	70 - 130				
1,2-Dibromoethane	22.39	1.0	20	0	112	76 - 123				
1,2-Dichlorobenzene	21.11	1.0	20	0	106	77 - 113				
1,2-Dichloroethane	22.56	1.0	20	0	113	70 - 124				
1,2-Dichloropropane	22.14	1.0	20	0	111	72 - 119				
1,3,5-Trimethylbenzene	19.98	1.0	20	0	99.9	75 - 118				
1,3-Dichlorobenzene	20.97	1.0	20	0	105	78 - 118				
1,3-Dichloropropane	21.84	1.0	20	0	109	75 - 116				
1,4-Dichlorobenzene	21.68	1.0	20	0	108	79 - 113				
2,2-Dichloropropane	22.14	1.0	20	0	111	70 - 130				
2-Butanone	39.81	2.0	40	0	99.5	70 - 130				
2-Chlorotoluene	22.93	1.0	20	0	115	70 - 128				
2-Hexanone	39.54	2.0	40	0	98.9	70 - 130				
4-Chlorotoluene	22.78	1.0	20	0	114	74 - 126				
4-Isopropyltoluene	19.4	1.0	20	0	97.0	74 - 126				
4-Methyl-2-pentanone	40.5	2.0	40	0	101	70 - 130				
Acetone	40.41	2.0	40	0	101	70 - 130				
Benzene	21.64	1.0	20	0	108	74 - 120				
Bromobenzene	20.92	1.0	20	0	105	78 - 113				
Bromochloromethane	22.15	1.0	20	0	111	76 - 124				
Bromodichloromethane	22.39	1.0	20	0	112	74 - 122				
Bromoform	21.3	1.0	20	0	107	73 - 128				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.16	1.0	20	0	121	70 - 130				
Carbon disulfide	40.05	2.0	40	0	100	70 - 130				
Carbon tetrachloride	21.81	1.0	20	0	109	71 - 125				
Chlorobenzene	22.48	1.0	20	0	112	76 - 113				
Chloroethane	18.82	1.0	20	0	94.1	70 - 130				
Chloroform	20.57	1.0	20	0	103	71 - 121				
Chloromethane	18.22	1.0	20	0	91.1	70 - 129				
cis-1,2-Dichloroethene	21.8	1.0	20	0	109	75 - 122				
cis-1,3-Dichloropropene	23.68	1.0	20	0	118	73 - 127				
Dibromochloromethane	21.85	1.0	20	0	109	77 - 122				
Dibromomethane	22.8	1.0	20	0	114	78 - 121				
Dichlorodifluoromethane	16.02	1.0	20	0	80.1	70 - 130				
Ethylbenzene	23.45	1.0	20	0	117	77 - 117				S
Hexachlorobutadiene	20.75	1.0	20	0	104	70 - 130				
Isopropylbenzene	21.35	1.0	20	0	107	73 - 127				
m,p-Xylene	48.78	2.0	40	0	122	77 - 122				
Methylene chloride	21.65	2.0	20	0	108	70 - 127				
Naphthalene	19.4	1.0	20	0	97.0	70 - 130				
n-Butylbenzene	21.53	1.0	20	0	108	72 - 130				
n-Propylbenzene	22.93	1.0	20	0	115	73 - 124				
o-Xylene	23.76	1.0	20	0	119	75 - 119				
sec-Butylbenzene	19.62	1.0	20	0	98.1	73 - 128				
Styrene	22.74	1.0	20	0	114	72 - 126				
tert-Butylbenzene	22.15	1.0	20	0	111	73 - 124				
Tetrachloroethene	21.25	1.0	20	0	106	76 - 119				
Toluene	21.16	1.0	20	0	106	77 - 118				
trans-1,2-Dichloroethene	22.17	1.0	20	0	111	72 - 127				
trans-1,3-Dichloropropene	23.72	1.0	20	0	119	77 - 119				
Trichloroethene	23.1	1.0	20	0	115	77 - 121				
Trichlorofluoromethane	20.46	1.0	20	0	102	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.15*	*1.0*	*50*	*0*	*92.3*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.86*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.17*	*1.0*	*50*	*0*	*94.3*	*73 - 126*				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.26*	*1.0*	*50*	*0*	*90.5*	*81 - 120*				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781190** 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	19.93	1.0	20	0	99.6	70 - 120				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.64	1.0	20	0	108	70 - 130				
1,1,2-Trichloroethane	19.52	1.0	20	0	97.6	70 - 117				
1,1-Dichloroethane	19.44	1.0	20	0	97.2	70 - 127				
1,1-Dichloroethene	20.24	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	22.55	1.0	20	0	113	70 - 129				
1,2,3-Trichlorobenzene	16.48	1.0	20	0	82.4	70 - 130				
1,2,3-Trichloropropane	16.73	1.0	20	0	83.6	70 - 130				
1,2,4-Trichlorobenzene	17.65	1.0	20	0	88.3	70 - 125				
1,2,4-Trimethylbenzene	19.83	1.0	20	0	99.2	70 - 125				
1,2-Dibromo-3-chloropropane	14.87	1.0	20	0	74.4	70 - 130				
1,2-Dibromoethane	19.89	1.0	20	0	99.5	70 - 124				
1,2-Dichlorobenzene	18.74	1.0	20	0	93.7	70 - 115				
1,2-Dichloroethane	19.14	1.0	20	0	95.7	70 - 127				
1,2-Dichloropropane	20.52	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	18.38	1.0	20	0	91.9	70 - 126				
1,3-Dichlorobenzene	18.85	1.0	20	0	94.2	70 - 119				
1,3-Dichloropropane	19.64	1.0	20	0	98.2	70 - 121				
1,4-Dichlorobenzene	19.01	1.0	20	0	95.1	70 - 114				
2,2-Dichloropropane	20.09	1.0	20	0	100	70 - 130				
2-Butanone	34.38	2.0	40	0	86.0	70 - 130				
2-Chlorotoluene	20.71	1.0	20	0	104	70 - 130				
2-Hexanone	34.15	2.0	40	0	85.4	70 - 130				
4-Chlorotoluene	20.55	1.0	20	0	103	70 - 130				
4-Isopropyltoluene	17.83	1.0	20	0	89.2	70 - 130				
4-Methyl-2-pentanone	36.27	2.0	40	0	90.7	70 - 130				
Acetone	35.8	2.0	40	0	89.5	70 - 130				
Benzene	20.48	1.0	20	0	102	70 - 127				
Bromobenzene	19.06	1.0	20	0	95.3	70 - 115				
Bromochloromethane	19.62	1.0	20	0	98.1	70 - 127				
Bromodichloromethane	20.37	1.0	20	0	102	70 - 124				
Bromoform	18.57	1.0	20	0	92.9	70 - 129				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.12	1.0	20	0	116	70 - 130				
Carbon disulfide	39.49	2.0	40	0	98.7	70 - 130				
Carbon tetrachloride	21.31	1.0	20	0	107	70 - 130				
Chlorobenzene	20.51	1.0	20	0	103	70 - 114				
Chloroethane	19.96	1.0	20	0	99.8	70 - 130				
Chloroform	18.95	1.0	20	0	94.7	70 - 125				
Chloromethane	16.31	1.0	20	0	81.5	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	21.1	1.0	20	0	106	70 - 125				
Dibromochloromethane	19.32	1.0	20	0	96.6	70 - 124				
Dibromomethane	20.47	1.0	20	0	102	70 - 124				
Dichlorodifluoromethane	16.46	1.0	20	0	82.3	70 - 130				
Ethylbenzene	22.32	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	18.59	1.0	20	0	92.9	70 - 130				
Isopropylbenzene	19.83	1.0	20	0	99.2	70 - 130				
m,p-Xylene	44.08	2.0	40	0	110	70 - 130				
Methylene chloride	19.79	2.0	20	0	99.0	70 - 128				
Naphthalene	14.85	1.0	20	0	74.2	70 - 130				
n-Butylbenzene	19.62	1.0	20	0	98.1	70 - 130				
n-Propylbenzene	21.13	1.0	20	0	106	70 - 130				
o-Xylene	21.69	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.74	1.0	20	0	93.7	70 - 130				
Styrene	19.72	1.0	20	0	98.6	70 - 130				
tert-Butylbenzene	20.67	1.0	20	0	103	70 - 130				
Tetrachloroethene	20.42	1.0	20	0	102	70 - 130				
Toluene	20.05	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	20.57	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	21.52	1.0	20	0	108	70 - 121				
Trichloroethene	21.28	1.0	20	0	106	70 - 129				
Trichlorofluoromethane	21.09	1.0	20	0	105	70 - 130				
Vinyl chloride	20.12	1.0	20	0	101	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.12*	*1.0*	*50*	*0*	*94.2*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.83*	*1.0*	*50*	*0*	*104*	*81 - 113*				
Surr: Dibromofluoromethane	*47.28*	*1.0*	*50*	*0*	*94.6*	*77 - 123*				

Revision: 2

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781191** 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	19.67	1.0	20	0	98.3	70 - 120	19.93	1.3	20	
1,1,1-Trichloroethane	18.24	1.0	20	0	91.2	70 - 130	19.47	6.49	20	
1,1,2,2-Tetrachloroethane	15.89	1.0	20	0	79.5	70 - 123	16.62	4.49	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	19.82	1.0	20	0	99.1	70 - 130	21.64	8.76	20	
1,1,2-Trichloroethane	19.13	1.0	20	0	95.7	70 - 117	19.52	2	20	
1,1-Dichloroethane	18.24	1.0	20	0	91.2	70 - 127	19.44	6.36	20	
1,1-Dichloroethene	18.81	1.0	20	0	94.0	70 - 130	20.24	7.34	20	
1,1-Dichloropropene	20.91	1.0	20	0	105	70 - 129	22.55	7.55	20	
1,2,3-Trichlorobenzene	16.77	1.0	20	0	83.8	70 - 130	16.48	1.73	20	
1,2,3-Trichloropropane	16.43	1.0	20	0	82.1	70 - 130	16.73	1.82	20	
1,2,4-Trichlorobenzene	17.98	1.0	20	0	89.9	70 - 125	17.65	1.85	20	
1,2,4-Trimethylbenzene	19.53	1.0	20	0	97.7	70 - 125	19.83	1.53	20	
1,2-Dibromo-3-chloropropane	14.25	1.0	20	0	71.3	70 - 130	14.87	4.25	20	
1,2-Dibromoethane	19.34	1.0	20	0	96.7	70 - 124	19.89	2.81	20	
1,2-Dichlorobenzene	18.24	1.0	20	0	91.2	70 - 115	18.74	2.71	20	
1,2-Dichloroethane	19.32	1.0	20	0	96.6	70 - 127	19.14	0.916	20	
1,2-Dichloropropane	20.11	1.0	20	0	101	70 - 122	20.52	1.99	20	
1,3,5-Trimethylbenzene	17.6	1.0	20	0	88.0	70 - 126	18.38	4.3	20	
1,3-Dichlorobenzene	18.73	1.0	20	0	93.6	70 - 119	18.85	0.636	20	
1,3-Dichloropropane	18.95	1.0	20	0	94.7	70 - 121	19.64	3.62	20	
1,4-Dichlorobenzene	18.82	1.0	20	0	94.1	70 - 114	19.01	1.04	20	
2,2-Dichloropropane	18.81	1.0	20	0	94.0	70 - 130	20.09	6.58	20	
2-Butanone	34.35	2.0	40	0	85.9	70 - 130	34.38	0.0911	20	
2-Chlorotoluene	19.91	1.0	20	0	99.6	70 - 130	20.71	3.92	20	
2-Hexanone	34.65	2.0	40	0	86.6	70 - 130	34.15	1.46	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.55	2.26	20	
4-Isopropyltoluene	17.1	1.0	20	0	85.5	70 - 130	17.83	4.21	20	
4-Methyl-2-pentanone	35.68	2.0	40	0	89.2	70 - 130	36.27	1.63	20	
Acetone	32.18	2.0	40	0	80.4	70 - 130	35.8	10.7	20	
Benzene	19.68	1.0	20	0	98.4	70 - 127	20.48	3.98	20	
Bromobenzene	18.59	1.0	20	0	93.0	70 - 115	19.06	2.49	20	
Bromochloromethane	19.83	1.0	20	0	99.1	70 - 127	19.62	1.07	20	
Bromodichloromethane	19.79	1.0	20	0	98.9	70 - 124	20.37	2.89	20	
Bromoform	18.27	1.0	20	0	91.3	70 - 129	18.57	1.65	20	

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.98	1.0	20	0	105	70 - 130	23.12	9.72	20	
Carbon disulfide	36.19	2.0	40	0	90.5	70 - 130	39.49	8.72	20	
Carbon tetrachloride	20.74	1.0	20	0	104	70 - 130	21.31	2.73	20	
Chlorobenzene	19.53	1.0	20	0	97.6	70 - 114	20.51	4.92	20	
Chloroethane	18.48	1.0	20	0	92.4	70 - 130	19.96	7.72	20	
Chloroform	18.47	1.0	20	0	92.4	70 - 125	18.95	2.55	20	
Chloromethane	15.83	1.0	20	0	79.1	70 - 130	16.31	3.01	20	
cis-1,2-Dichloroethene	19.71	1.0	20	0	98.5	70 - 128	20.24	2.69	20	
cis-1,3-Dichloropropene	20.74	1.0	20	0	104	70 - 125	21.1	1.73	20	
Dibromochloromethane	18.89	1.0	20	0	94.5	70 - 124	19.32	2.25	20	
Dibromomethane	20.01	1.0	20	0	100	70 - 124	20.47	2.29	20	
Dichlorodifluoromethane	14.34	1.0	20	0	71.7	70 - 130	16.46	13.8	20	
Ethylbenzene	20.91	1.0	20	0	105	70 - 124	22.32	6.53	20	
Hexachlorobutadiene	17.83	1.0	20	0	89.2	70 - 130	18.59	4.17	20	
Isopropylbenzene	18.68	1.0	20	0	93.4	70 - 130	19.83	5.99	20	
m,p-Xylene	41.93	2.0	40	0	105	70 - 130	44.08	5	20	
Methylene chloride	19.21	2.0	20	0	96.1	70 - 128	19.79	2.98	20	
Naphthalene	15.43	1.0	20	0	77.2	70 - 130	14.85	3.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.62	3.74	20	
n-Propylbenzene	19.91	1.0	20	0	99.6	70 - 130	21.13	5.92	20	
o-Xylene	20.75	1.0	20	0	104	70 - 124	21.69	4.43	20	
sec-Butylbenzene	17.69	1.0	20	0	88.5	70 - 130	18.74	5.72	20	
Styrene	19.17	1.0	20	0	95.8	70 - 130	19.72	2.83	20	
tert-Butylbenzene	19.41	1.0	20	0	97.1	70 - 130	20.67	6.26	20	
Tetrachloroethene	19.01	1.0	20	0	95.0	70 - 130	20.42	7.18	20	
Toluene	18.86	1.0	20	0	94.3	70 - 123	20.05	6.11	20	
trans-1,2-Dichloroethene	19.55	1.0	20	0	97.8	70 - 130	20.57	5.06	20	
trans-1,3-Dichloropropene	21.15	1.0	20	0	106	70 - 121	21.52	1.72	20	
Trichloroethene	20.09	1.0	20	0	100	70 - 129	21.28	5.75	20	
Trichlorofluoromethane	19.62	1.0	20	0	98.1	70 - 130	21.09	7.23	20	
Vinyl chloride	18.52	1.0	20	0	92.6	70 - 130	20.12	8.3	20	
Surr: 1,2-Dichloroethane-d4	*46.4*	*1.0*	*50*	*0*	*92.8*	*70 - 126*	*47.12*	*1.54*	*20*	
Surr: 4-Bromofluorobenzene	*50.76*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.83*	*2.1*	*20*	
Surr: Dibromofluoromethane	*46.93*	*1.0*	*50*	*0*	*93.9*	*77 - 123*	*47.28*	*0.751*	*20*	

Revision: 2

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100726

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: **16SW01-181011** Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*	*44.83*	*0.00577*	*20*	

The following samples were analyzed in this batch: HS18100726-01 HS18100726-02 HS18100726-03 HS18100726-04 HS18100726-05

Revision: 2

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS18100726**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100726

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18100726-01	16TB04-181011	Login	10/13/2018 4:52:50 PM	PJM	VOA259

Revision:2

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100726

Date/Time Received: **13-Oct-2018 09:40**
Received by: **PJM**

Checklist completed by: *Pablo Marinez* 13-Oct-2018
eSignature | Date

Reviewed by:
eSignature | Date

Matrices: **WATER**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.3C/1.0C UC/C	IR # 25
Cooler(s)/Kit(s):	44084	
Date/Time sample(s) sent to storage:	10/13/2018 17:00	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☑	☐	N/A ☐
pH adjusted?	☐	☑	N/A ☐

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-SW-ALSHT-181011 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO			
Facility Name	Longhorn AAP		
Project Number	501032		
	LHAAP-50		
Address	1203-B East Grand Avenue		
	PMB 202		
City	Marshall	State	TX
Postal Code	75670	Country	USA
Phone Number	713.243.7264		
Project Manager	Praveen Srivastav		

LABORATORY			
Lab Name	ALS Laboratories		
Lab Contact	RJ Modashia		
Email	RJ.Modashia@alsglobal.com		
Address	10450 Stancliff Rd., Suite 210		
City	Houston	State	TX
Postal Code	77099	Country	USA
Phone Number	281.575.2279 or 281.530.5656		

OTHER INFO			
Email Invoice To	FedInvoices@aptim.com		
Email Report To	kim.napier@aptim.com		
Mail Reports To	Kim Napier		
Address	2410 Cherahala Blvd.		
City	Knoxville	State	TN
Postal Code	37932	Country	USA
Shipping Company	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS: VOCs in Water by 8260B	Perchlorate in Water by 6850	Metals by 6020 (As, Cr, Mn, Ni, Tl)
16TB04-181011	FIELD QC				LIQ	10/11/2018	1300	2	2		
16SW01-181011	16SW01				SW	10/11/2018	1355	5	3	1	1
16SW01-181011-FD	16SW01				SW	10/11/2018	1355	5	3	1	1
16SW01-181011-MS	16SW01				SW	10/11/2018	1355	5	3	1	1
16SW01-181011-MSD	16SW01				SW	10/11/2018	1355	5	3	1	1
16SW02-181011	16SW02				SW	10/11/2018	1510	5	3	1	1
16SW03-181011	16SW03				SW	10/11/2018	1630	5	3	1	1

HS18100726

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	APTM	10/12/18 1810	ALS PM	10/13/18 9:46

UU, SH UC IR CF

CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

FedEx
TRK# 0221 4380 9533 1366
SATURDAY 12:00P
PRIORITY OVERNIGHT
XO SGRA
77099
TX-US IAH

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828987; 1828988; 1828989; 1829115

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2159 (225647)

General Set Information: There were eighteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly.

Method QC data: The method blank (LMB 624449) was less than 1/2 the CRDL. The recovery for the LCS (624450) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected. The relative percent differences (RPD's) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 25, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 29, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1828988**
Project ID: HS18100726 101118
Purchase Order: HS18100726
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16SW01-181011	1828988001	10/11/18	10/16/18	
16SW01-181011-FD	1828988004	10/11/18	10/16/18	
16SW02-181011	1828988005	10/11/18	10/16/18	
16SW03-181011	1828988006	10/11/18	10/16/18	

Client QC ID *	Lab ID	Collect Date	Receive Date	Sampling Site
16SW01-181011MS	1828988002	10/11/18	10/16/18	
16SW01-181011MSD	1828988003	10/11/18	10/16/18	

***Client QC is reported as part of the Quality Control results report, if requested.**

ANALYTICAL REPORT

Workorder: 34-1828988
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16SW01-181011** | Sampling Site: NA | Collected: 10/11/2018
Lab ID: 1828988001 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 09:40
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16SW01-181011-FD** | Sampling Site: NA | Collected: 10/11/2018
Lab ID: 1828988004 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 10:22
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16SW02-181011** | Sampling Site: NA | Collected: 10/11/2018
Lab ID: 1828988005 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 10:36
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16SW03-181011** | Sampling Site: NA | Collected: 10/11/2018
Lab ID: 1828988006 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 10:50
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

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ANALYTICAL REPORT

Workorder: 34-1828988
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/25/2018 14:54	/S/ Stephen Brose 10/29/2018 08:45

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

ANALYTICAL REPORT

Workorder: 34-1828988
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

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Quality Control Sample
Batch Report

Analysis Information

Workorder: 1828988

Limits: Client SOW/Contract Specified
Basis: DoD QSM
Preparation: NA
Batch: NA
Prepared By: NA
Analysis: EPA 6850, DoD QSM
Batch: ELMS/2159 (HBN: 225647)
Analyzed By: Thomas Bosch

Blank

LMB: 624449
Analyzed: 10/24/2018 08:55
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 624450
Analyzed: 10/24/2018 09:09
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.90	5.00	97.9	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828988001		MS: 1828988002					MSD: 1828988003				
Analyzed: 10/24/2018 09:40		Analyzed: 10/24/2018 09:54					Analyzed: 10/24/2018 10:08				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	4.75	5	94.9	78.8	123.8	4.67	93.3	1.7	0.0	20.0

Sample: 1828989004		MS: 1828989005					MSD: 1828989006				
Analyzed: 10/24/2018 11:47		Analyzed: 10/24/2018 12:29					Analyzed: 10/24/2018 12:43				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	5.4	5	108	78.8	123.8	6.26	# 125	14.7	0.0	20.0

Continuing Calibration Verification

CCV: 624446				CCV: 624451			CCV: 624453		
Analyzed: 10/24/2018 08:12				Analyzed: 10/24/2018 12:01			Analyzed: 10/24/2018 15:06		
Units: ug/L				Units: ug/L			Units: ug/L		
Criteria: ± 15%				Criteria: ± 15%			Criteria: ± 15%		
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	24.4	25.0	97.6	23.5	25.0	94.0	23.5	25.0	94.2

Interference Check Sample

ICSA: 624448
Analyzed: 10/24/2018 08:41
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	0.985	1.00	98.5

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1828988**

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2159 (HBN: 225647)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Limit of Detection Verification

LODV:	624447			**LODV:**	624452		**LODV:**	624454	
Analyzed:	10/24/2018 08:27			**Analyzed:**	10/24/2018 12:15		**Analyzed:**	10/24/2018 15:20	
Units:	ug/L			**Units:**	ug/L		**Units:**	ug/L	
Criteria:	± 50%			**Criteria:**	± 50%		**Criteria:**	± 50%	
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	1.03	1.00	103	0.970	1.00	97.0	1.02	1.00	102

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/25/2018 14:54	10/29/2018 08:45

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

10450 Stancliff Rd, Ste 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887
www.alsglobal.com

W 1828988

Subcontract Chain of Custody

COC ID: 10012

1828988

SUBCONTRACT TO:

ALS Laboratory Group
960 West LeVoy Drive
Salt Lake City, UT 84123

Phone: +1 800 356 9135

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:	HS18100726
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100726-02**	**16SW01-181011**	**Surface Water**	**11 Oct 2018 13:55** MS/MSD
	SUB_Perch-6850			23 Oct 2018
2.	**HS18100726-03**	**16SW01-181011-FD**	**Surface Water**	**11 Oct 2018 13:55**
	SUB_Perch-6850			23 Oct 2018
3.	**HS18100726-04**	**16SW02-181011**	**Surface Water**	**11 Oct 2018 15:10**
	SUB_Perch-6850			23 Oct 2018
4.	**HS18100726-05**	**16SW03-181011**	**Surface Water**	**11 Oct 2018 16:30**
	SUB_Perch-6850			23 Oct 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: 10/15/18 1800.

Received By: Deborah Hill Date/Time: 10/16/2018 10:20

Cooler ID(s): _____ Temperature(s): _____

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100726 | ***Split:*** | **Workorder ID:** 1828988 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
1	10/11/2018 13:55	16SW01-181011	1828988001		Water	A	1	A
2	10/11/2018 13:55	16SW01-181011MS	1828988002	MS	Water	A	1	A
3	10/11/2018 13:55	16SW01-181011MSD	1828988003	MSD	Water	A	1	A
4	10/11/2018 13:55	16SW01-181011-FD	1828988004	FLDDUP	Water	A	1	A
5	10/11/2018 15:10	16SW02-181011	1828988005		Water	A	1	A
6	10/11/2018 16:30	16SW03-181011	1828988006		Water	A	1	A
7								
8								
9								
10								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/16/2018 10:20	ALS Sample Receiving	Sample Login
Julie Warath	10/17/18 1000	3C	storage
R.33.1 10	23.18/14.10	T. Bond	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ **Lab Notebook No.:** _____

Prepared / Analyzed by: _____ **Date / Time:** _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

188488

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: HS181007260/10012

Date/Time of Receipt: 10/16/2018 10:20

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 88201	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Desiree Hill (Signature) Desiree Hill (Printed Name) 10/16/2018 (Date)

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Residual Chlorine Present
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Received 3 bottles for sample HS181007260-02

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Part # 159469-434 FUT2 EXP 07/19

Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 15OCT18
ACTWGT: 22.55 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18100725/726/727 – RJ

FedEx Express

TRK# 0201 **4380 9533 6070**

TUE – 16 OCT 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

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Batch Worklist

Batch: ELMS/ 2159 **Created:** 10/23/2018 18:03 **Instrument:** **HBN:** 225647

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828987 [ENV_LVL4]
Workorder: 1828988 [ENV_LVL4]
Workorder: 1828989 [ENV_LVL4]
Workorder: 1829115 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	624446	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
2	624447	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
3	624448	ICS for HBN 225647 [ELMS/2159]				ICS	3		E6850..D3Q	5311		10/29/2018	
4	624449	LMB for HBN 225647 [ELMS/2159]				LMB	3		E6850Q413Q	5311		10/29/2018	
5	624450	LCS for HBN 225647 [ELMS/2159]				LCS	3		E6850Q413Q	5311		10/29/2018	
6	1828987001	16WW32-181011				SAMPLE	3	1828987001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
7	1828988001	16SW01-181011				SAMPLE	3	1828988001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
8	1828988002	16SW01-181011MS				MS	3	1828988002-A	E6850Q413Q	5480		10/29/2018	
9	1828988003	16SW01-181011MSD				MSD	3	1828988003-A	E6850Q413Q	5480		10/29/2018	
10	1828988004	16SW01-181011-FD				FLDDUP	3	1828988004-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
11	1828988005	16SW02-181011				SAMPLE	3	1828988005-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
12	1828988006	16SW03-181011				SAMPLE	3	1828988006-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
13	1828989001	16WW30-181012				SAMPLE	3	1828989001-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
14	1828989002	16WW46-181012				SAMPLE	3	1828989002-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
15	1828989003	16WW23-181012				SAMPLE	3	1828989003-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
16	1828989004	16WW40-181012				SAMPLE	3	1828989004-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
17	624451	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
18	624452	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
19	1828989005	16WW40-181012MS				MS	3	1828989005-A	E6850Q413Q	5480		10/29/2018	
20	1828989006	16WW40-181012MSD				MSD	3	1828989006-A	E6850Q413Q	5480		10/29/2018	
21	1828989007	16WW40-181012-FD				FLDDUP	3	1828989007-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
22	1828989008	16WW27-181012				SAMPLE	3	1828989008-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
23	1828989009	16WW12-181012				SAMPLE	3	1828989009-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
24	1828989010	16WW42-181012				SAMPLE	3	1828989010-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
25	1828989011	16WW13-181012				SAMPLE	3	1828989011-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
26	1828989012	16WW21-181012				SAMPLE	3	1828989012-A	E6850Q41.3	5480	11/9/2018	10/29/2018	

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Batch Worklist

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
27	1828989013	16EB01-181012				EQBK	3	1828989013-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
28	1829115001	16WW29-181015				SAMPLE	3	1829115001-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
29	1829115002	16WW55-181015				SAMPLE	3	1829115002-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
30	624453	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
31	624454	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828987 (001); 1828988 (001-06); 1828989 (001-13); 1829115 (001,02)
ELMS Batch/HBN ID: 2159 (225647)
Prep Date: 10/23/2018 Analysis Date: 10/24/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\24OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 624450; Target = 5.0µg/L. ASTM type II water was used for LMB 624449.

MS/MSD: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:

1) Results reported in µg/L. Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly. Samples 1828989004/07 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters, except for the following. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225647-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS 2159 HBN 225647 **Sample Set IDs if Applicable:** 18-28987/18289881/18 28989/1829115	**Analyst Initials**	**Reviewer Initials**
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

T.B. 10.26.18
SB 10/29/18

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ALS

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard: 43659	**Created By:** Thomas Bosch	**Amount:** 100 mL
MFG: AccuStandard	**Create Date:** 09/17/2018 09:09AM	**Expires:** 07/25/2020
MFG Lot: 218065075		**Usable:** No
Part ID: IC-PER-10X-1		**Lab Lot:** CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O			**Description - ASTM Type II Water**
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L	
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025	
MFG Lot: Not Provided		**Usable:** Yes	
Part ID: Not Provided		**Lab Lot:** LAB 109	

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description - 6850 QC Stock STD 1,000ug/mL**

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK		Description - Perchlorate ISTD Wrk 1,000ug/L
Standard: 43730	**Created By:** Thomas Bosch	**Amount:** 25 mL
MFG: ALS/SLC	**Create Date:** 09/20/2018 09:09AM	**Expires:** 09/20/2019
MFG Lot: TNB: 05/09/2018	**Verified By:** Thomas Bosch	**Usable:** Yes
Pipette ID: Not Provided	**Verify Date:**	**Lab Lot:** CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number:	ICC-013	Lot Issue Date:	29-Feb 2016
Lot Number:	CP-0860	Expiration Date:	31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER — ANAB ACCREDITED TESTING LABORATORY

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
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www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

GHS

Signal Word: None

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

** For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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10450 Stancliff Rd. Suite 210
Houston, TX 77099
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F: +1 281 530 5887

March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100727**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 12 sample(s) on Oct 13, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100727

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100727-01	16TB05-181012	Liquid	VBLKW-092618-50	12-Oct-2018 08:30	13-Oct-2018 09:40	☐
HS18100727-02	16WW30-181012	GW		12-Oct-2018 10:30	13-Oct-2018 09:40	☐
HS18100727-03	16WW46-181012	GW		12-Oct-2018 11:05	13-Oct-2018 09:40	☐
HS18100727-04	16WW23-181012	GW		12-Oct-2018 11:55	13-Oct-2018 09:40	☐
HS18100727-05	16WW40-181012	GW		12-Oct-2018 12:35	13-Oct-2018 09:40	☐
HS18100727-06	16WW40-181012-FD	GW		12-Oct-2018 12:35	13-Oct-2018 09:40	☐
HS18100727-07	16WW27-181012	GW		12-Oct-2018 13:10	13-Oct-2018 09:40	☐
HS18100727-08	16WW12-181012	GW		12-Oct-2018 13:50	13-Oct-2018 09:40	☐
HS18100727-09	16WW42-181012	GW		12-Oct-2018 14:25	13-Oct-2018 09:40	☐
HS18100727-10	16WW13-181012	GW		12-Oct-2018 15:15	13-Oct-2018 09:40	☐
HS18100727-11	16WW21-181012	GW		12-Oct-2018 15:40	13-Oct-2018 09:40	☐
HS18100727-12	16EB01-181012	GW		12-Oct-2018 16:30	13-Oct-2018 09:40	☐

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100727

CASE NARRATIVE

Work Order Comments

- Revised to updated the VOC list.
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R325772

Sample ID: CCV

- Bromomethane and m,p-Xylenes exceeded %D limits on CCV. Samples ND.

Sample ID: VLCSW-181018

- Ethylbenzene exceeded %recovery limits on LCS. Samples ND.

Batch ID: R325826

Sample ID: 16WW40-181012 (HS18100727-05MS)

- 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: 16WW40-181012 (HS18100727-05MSD)

- 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.

Batch ID: ,R325844

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R325666

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16TB05-181012
Collection Date: 12-Oct-2018 08:30

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-01
Matrix:Liquid

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 04:39
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:39
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:39
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:39
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 04:39
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:39
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 04:39
Surr: 1,2-Dichloroethane-d4	*89.5*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 04:39*
Surr: 4-Bromofluorobenzene	*97.6*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 04:39*
Surr: Dibromofluoromethane	*97.3*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 04:39*
Surr: Toluene-d8	*93.2*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 04:39*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW30-181012
Collection Date: 12-Oct-2018 10:30

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-02
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 08:43
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:43
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:43
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:43
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 08:43
Trichloroethene	**1.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 08:43
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 08:43
Surr: 1,2-Dichloroethane-d4	*88.8*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 08:43*
Surr: 4-Bromofluorobenzene	*97.0*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 08:43*
Surr: Dibromofluoromethane	*92.9*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 08:43*
Surr: Toluene-d8	*92.4*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 08:43*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.22**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 07:52
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW46-181012
Collection Date: 12-Oct-2018 11:05

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-03
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 09:07
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:07
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:07
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:07
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 09:07
Trichloroethene	**3.0**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 09:07
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:07
Surr: 1,2-Dichloroethane-d4	*88.0*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 09:07*
Surr: 4-Bromofluorobenzene	*96.8*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 09:07*
Surr: Dibromofluoromethane	*95.5*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 09:07*
Surr: Toluene-d8	*91.2*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 09:07*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW23-181012
Collection Date: 12-Oct-2018 11:55

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-04
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 09:32
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:32
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:32
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:32
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 09:32
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:32
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 09:32
Surr: 1,2-Dichloroethane-d4	*90.8*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 09:32*
Surr: 4-Bromofluorobenzene	*96.6*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 09:32*
Surr: Dibromofluoromethane	*97.7*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 09:32*
Surr: Toluene-d8	*93.5*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 09:32*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW40-181012
Collection Date: 12-Oct-2018 12:35

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-05
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 15:58
1,1-Dichloroethene	**3.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 15:58
1,2-Dichloroethane	**3.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 15:58
cis-1,2-Dichloroethene	**220**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 16:25
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 15:58
Trichloroethene	**660**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 16:25
Vinyl chloride	**4.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 15:58
Surr: 1,2-Dichloroethane-d4	*94.4*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 15:58*
Surr: 1,2-Dichloroethane-d4	*89.8*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 16:25*
Surr: 4-Bromofluorobenzene	*98.1*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 15:58*
Surr: 4-Bromofluorobenzene	*98.6*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 16:25*
Surr: Dibromofluoromethane	*93.0*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 15:58*
Surr: Dibromofluoromethane	*94.0*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 16:25*
Surr: Toluene-d8	*92.1*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 15:58*
Surr: Toluene-d8	*93.0*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 16:25*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**5.57**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 08:07
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW40-181012-FD
Collection Date: 12-Oct-2018 12:35

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-06
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 20:36
1,1-Dichloroethene	**3.5**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 20:36
1,2-Dichloroethane	**3.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 20:36
cis-1,2-Dichloroethene	**240**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 21:03
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 20:36
Trichloroethene	**640**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 21:03
Vinyl chloride	**4.2**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 20:36
Surr: 1,2-Dichloroethane-d4	*94.8*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 20:36*
Surr: 1,2-Dichloroethane-d4	*92.0*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 21:03*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 20:36*
Surr: 4-Bromofluorobenzene	*98.3*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 21:03*
Surr: Dibromofluoromethane	*96.5*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 20:36*
Surr: Dibromofluoromethane	*95.7*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 21:03*
Surr: Toluene-d8	*91.3*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 20:36*
Surr: Toluene-d8	*91.5*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 21:03*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**5.72**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 08:51
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW27-181012
Collection Date: 12-Oct-2018 13:10

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-07
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 18:58
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 18:58
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 18:58
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 18:58
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 18:58
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	20-Oct-2018 13:17
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 18:58
Surr: 1,2-Dichloroethane-d4	*92.0*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 18:58*
Surr: 1,2-Dichloroethane-d4	*88.0*			**0**	*70-126*	*%REC*	*1*	*20-Oct-2018 13:17*
Surr: 4-Bromofluorobenzene	*98.5*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 18:58*
Surr: 4-Bromofluorobenzene	*97.6*			**0**	*81-113*	*%REC*	*1*	*20-Oct-2018 13:17*
Surr: Dibromofluoromethane	*96.5*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 18:58*
Surr: Dibromofluoromethane	*95.9*			**0**	*77-123*	*%REC*	*1*	*20-Oct-2018 13:17*
Surr: Toluene-d8	*92.9*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 18:58*
Surr: Toluene-d8	*93.1*			**0**	*82-127*	*%REC*	*1*	*20-Oct-2018 13:17*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW12-181012
Collection Date: 12-Oct-2018 13:50

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-08
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	19-Oct-2018 21:30
1,1-Dichloroethene	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 21:30
1,2-Dichloroethane	**16**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 21:30
cis-1,2-Dichloroethene	**86**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 21:30
Methylene chloride	10	U	10	10	20	ug/L	10	19-Oct-2018 21:30
Trichloroethene	**4,100**		**20**	**50**	**100**	**ug/L**	100	19-Oct-2018 21:57
Vinyl chloride	**12**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 21:30
Surr: 1,2-Dichloroethane-d4	*91.5*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 21:30*
Surr: 1,2-Dichloroethane-d4	*89.7*			**0**	*70-126*	*%REC*	*100*	*19-Oct-2018 21:57*
Surr: 4-Bromofluorobenzene	*96.9*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 21:30*
Surr: 4-Bromofluorobenzene	*98.9*			**0**	*81-113*	*%REC*	*100*	*19-Oct-2018 21:57*
Surr: Dibromofluoromethane	*96.1*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 21:30*
Surr: Dibromofluoromethane	*95.2*			**0**	*77-123*	*%REC*	*100*	*19-Oct-2018 21:57*
Surr: Toluene-d8	*90.9*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 21:30*
Surr: Toluene-d8	*92.7*			**0**	*82-127*	*%REC*	*100*	*19-Oct-2018 21:57*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.90**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 07:09
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW42-181012
Collection Date: 12-Oct-2018 14:25

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-09
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 19:22
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:22
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:22
cis-1,2-Dichloroethene	**42**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 19:22
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 19:22
Trichloroethene	**6.0**		**0.20**	**0.50**	**1.0**	**ug/L**	1	19-Oct-2018 19:22
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:22
Surr: 1,2-Dichloroethane-d4	*94.0*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 19:22*
Surr: 4-Bromofluorobenzene	*98.0*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 19:22*
Surr: Dibromofluoromethane	*97.3*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 19:22*
Surr: Toluene-d8	*91.3*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 19:22*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**0.182**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 05:12
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW13-181012
Collection Date: 12-Oct-2018 15:15

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-10
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	19-Oct-2018 22:24
1,1-Dichloroethene	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 22:24
1,2-Dichloroethane	5.0	U	2.0	5.0	10	ug/L	10	19-Oct-2018 22:24
cis-1,2-Dichloroethene	**1,700**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 22:24
Methylene chloride	10	U	10	10	20	ug/L	10	19-Oct-2018 22:24
Trichloroethene	**4,400**		**20**	**50**	**100**	**ug/L**	100	19-Oct-2018 22:51
Vinyl chloride	**51**		**2.0**	**5.0**	**10**	**ug/L**	10	19-Oct-2018 22:24
Surr: 1,2-Dichloroethane-d4	*90.6*			**0**	*70-126*	*%REC*	*100*	*19-Oct-2018 22:51*
Surr: 1,2-Dichloroethane-d4	*94.2*			**0**	*70-126*	*%REC*	*10*	*19-Oct-2018 22:24*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*81-113*	*%REC*	*10*	*19-Oct-2018 22:24*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*81-113*	*%REC*	*100*	*19-Oct-2018 22:51*
Surr: Dibromofluoromethane	*95.0*			**0**	*77-123*	*%REC*	*10*	*19-Oct-2018 22:24*
Surr: Dibromofluoromethane	*95.6*			**0**	*77-123*	*%REC*	*100*	*19-Oct-2018 22:51*
Surr: Toluene-d8	*91.4*			**0**	*82-127*	*%REC*	*10*	*19-Oct-2018 22:24*
Surr: Toluene-d8	*91.2*			**0**	*82-127*	*%REC*	*100*	*19-Oct-2018 22:51*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**0.929**		**0.150**	**0.500**	**0.500**	**mg/L**	5	17-Oct-2018 10:14
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW21-181012
Collection Date: 12-Oct-2018 15:40

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-11
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 19:47
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:47
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:47
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:47
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 19:47
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	20-Oct-2018 13:42
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 19:47
Surr: 1,2-Dichloroethane-d4	*91.9*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 19:47*
Surr: 1,2-Dichloroethane-d4	*91.6*			**0**	*70-126*	*%REC*	*1*	*20-Oct-2018 13:42*
Surr: 4-Bromofluorobenzene	*96.3*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 19:47*
Surr: 4-Bromofluorobenzene	*97.9*			**0**	*81-113*	*%REC*	*1*	*20-Oct-2018 13:42*
Surr: Dibromofluoromethane	*94.5*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 19:47*
Surr: Dibromofluoromethane	*96.5*			**0**	*77-123*	*%REC*	*1*	*20-Oct-2018 13:42*
Surr: Toluene-d8	*91.9*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 19:47*
Surr: Toluene-d8	*92.7*			**0**	*82-127*	*%REC*	*1*	*20-Oct-2018 13:42*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**0.218**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 05:41
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16EB01-181012
Collection Date: 12-Oct-2018 16:30

ANALYTICAL REPORT
WorkOrder:HS18100727
Lab ID:HS18100727-12
Matrix:GW

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	19-Oct-2018 20:11
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 20:11
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 20:11
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 20:11
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	19-Oct-2018 20:11
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 20:11
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	19-Oct-2018 20:11
Surr: 1,2-Dichloroethane-d4	*91.1*			**0**	*70-126*	*%REC*	*1*	*19-Oct-2018 20:11*
Surr: 4-Bromofluorobenzene	*98.0*			**0**	*81-113*	*%REC*	*1*	*19-Oct-2018 20:11*
Surr: Dibromofluoromethane	*93.7*			**0**	*77-123*	*%REC*	*1*	*19-Oct-2018 20:11*
Surr: Toluene-d8	*92.8*			**0**	*82-127*	*%REC*	*1*	*19-Oct-2018 20:11*
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	0.100	U	0.0300	0.100	0.100	mg/L	1	17-Oct-2018 04:58
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325666 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** GW	
HS18100727-02	16WW30-181012	12 Oct 2018 10:30			17 Oct 2018 07:52	10
HS18100727-05	16WW40-181012	12 Oct 2018 12:35			17 Oct 2018 08:07	10
HS18100727-06	16WW40-181012-FD	12 Oct 2018 12:35			17 Oct 2018 08:51	10
HS18100727-08	16WW12-181012	12 Oct 2018 13:50			17 Oct 2018 07:09	10
HS18100727-09	16WW42-181012	12 Oct 2018 14:25			17 Oct 2018 05:12	1
HS18100727-10	16WW13-181012	12 Oct 2018 15:15			17 Oct 2018 10:14	5
HS18100727-11	16WW21-181012	12 Oct 2018 15:40			17 Oct 2018 05:41	1
HS18100727-12	16EB01-181012	12 Oct 2018 16:30			17 Oct 2018 04:58	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** GW	
HS18100727-02	16WW30-181012	12 Oct 2018 10:30			19 Oct 2018 08:43	1
HS18100727-03	16WW46-181012	12 Oct 2018 11:05			19 Oct 2018 09:07	1
HS18100727-04	16WW23-181012	12 Oct 2018 11:55			19 Oct 2018 09:32	1
Batch ID: R325772 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Liquid	
HS18100727-01	16TB05-181012	12 Oct 2018 08:30			19 Oct 2018 04:39	1
Batch ID: R325826 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** GW	
HS18100727-05	16WW40-181012	12 Oct 2018 12:35			19 Oct 2018 16:25	10
HS18100727-05	16WW40-181012	12 Oct 2018 12:35			19 Oct 2018 15:58	1
HS18100727-06	16WW40-181012-FD	12 Oct 2018 12:35			19 Oct 2018 21:03	10
HS18100727-06	16WW40-181012-FD	12 Oct 2018 12:35			19 Oct 2018 20:36	1
HS18100727-07	16WW27-181012	12 Oct 2018 13:10			19 Oct 2018 18:58	1
HS18100727-08	16WW12-181012	12 Oct 2018 13:50			19 Oct 2018 21:57	100
HS18100727-08	16WW12-181012	12 Oct 2018 13:50			19 Oct 2018 21:30	10
HS18100727-09	16WW42-181012	12 Oct 2018 14:25			19 Oct 2018 19:22	1
HS18100727-10	16WW13-181012	12 Oct 2018 15:15			19 Oct 2018 22:51	100
HS18100727-10	16WW13-181012	12 Oct 2018 15:15			19 Oct 2018 22:24	10
HS18100727-11	16WW21-181012	12 Oct 2018 15:40			19 Oct 2018 19:47	1
HS18100727-12	16EB01-181012	12 Oct 2018 16:30			19 Oct 2018 20:11	1
Batch ID: R325844 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** GW	
HS18100727-07	16WW27-181012	12 Oct 2018 13:10			20 Oct 2018 13:17	1
HS18100727-11	16WW21-181012	12 Oct 2018 15:40			20 Oct 2018 13:42	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R326322 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** GW	
HS18100727-02	16WW30-181012	12 Oct 2018 10:30			29 Oct 2018 15:58	1
HS18100727-03	16WW46-181012	12 Oct 2018 11:05			29 Oct 2018 15:58	1
HS18100727-04	16WW23-181012	12 Oct 2018 11:55			29 Oct 2018 15:58	1
HS18100727-05	16WW40-181012	12 Oct 2018 12:35			29 Oct 2018 15:58	1
HS18100727-06	16WW40-181012-FD	12 Oct 2018 12:35			29 Oct 2018 15:58	1
HS18100727-07	16WW27-181012	12 Oct 2018 13:10			29 Oct 2018 15:58	1
HS18100727-08	16WW12-181012	12 Oct 2018 13:50			29 Oct 2018 15:58	1
HS18100727-09	16WW42-181012	12 Oct 2018 14:25			29 Oct 2018 15:58	1
HS18100727-10	16WW13-181012	12 Oct 2018 15:15			29 Oct 2018 15:58	1
HS18100727-11	16WW21-181012	12 Oct 2018 15:40			29 Oct 2018 15:58	1
HS18100727-12	16EB01-181012	12 Oct 2018 16:30			29 Oct 2018 15:58	1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** 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	*44.77*	*1.0*	*50*	*0*	*89.5*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.49*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*48.4*	*1.0*	*50*	*0*	*96.8*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:25**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781185** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.29*	*1.0*	*50*	*0*	*92.6*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** 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	21.9	1.0	20	0	110	77 - 118				
1,1,1-Trichloroethane	20.17	1.0	20	0	101	70 - 130				
1,1,2,2-Tetrachloroethane	18.73	1.0	20	0	93.7	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.13	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.59	1.0	20	0	108	77 - 113				
1,1-Dichloroethane	20.69	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.65	1.0	20	0	103	70 - 130				
1,1-Dichloropropene	22.03	1.0	20	0	110	78 - 118				
1,2,3-Trichlorobenzene	20.23	1.0	20	0	101	70 - 130				
1,2,3-Trichloropropane	18.8	1.0	20	0	94.0	70 - 127				
1,2,4-Trichlorobenzene	21.62	1.0	20	0	108	77 - 126				
1,2,4-Trimethylbenzene	22.46	1.0	20	0	112	73 - 121				
1,2-Dibromo-3-chloropropane	17.54	1.0	20	0	87.7	70 - 130				
1,2-Dibromoethane	22.39	1.0	20	0	112	76 - 123				
1,2-Dichlorobenzene	21.11	1.0	20	0	106	77 - 113				
1,2-Dichloroethane	22.56	1.0	20	0	113	70 - 124				
1,2-Dichloropropane	22.14	1.0	20	0	111	72 - 119				
1,3,5-Trimethylbenzene	19.98	1.0	20	0	99.9	75 - 118				
1,3-Dichlorobenzene	20.97	1.0	20	0	105	78 - 118				
1,3-Dichloropropane	21.84	1.0	20	0	109	75 - 116				
1,4-Dichlorobenzene	21.68	1.0	20	0	108	79 - 113				
2,2-Dichloropropane	22.14	1.0	20	0	111	70 - 130				
2-Butanone	39.81	2.0	40	0	99.5	70 - 130				
2-Chlorotoluene	22.93	1.0	20	0	115	70 - 128				
2-Hexanone	39.54	2.0	40	0	98.9	70 - 130				
4-Chlorotoluene	22.78	1.0	20	0	114	74 - 126				
4-Isopropyltoluene	19.4	1.0	20	0	97.0	74 - 126				
4-Methyl-2-pentanone	40.5	2.0	40	0	101	70 - 130				
Acetone	40.41	2.0	40	0	101	70 - 130				
Benzene	21.64	1.0	20	0	108	74 - 120				
Bromobenzene	20.92	1.0	20	0	105	78 - 113				
Bromochloromethane	22.15	1.0	20	0	111	76 - 124				
Bromodichloromethane	22.39	1.0	20	0	112	74 - 122				
Bromoform	21.3	1.0	20	0	107	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.16	1.0	20	0	121	70 - 130				
Carbon disulfide	40.05	2.0	40	0	100	70 - 130				
Carbon tetrachloride	21.81	1.0	20	0	109	71 - 125				
Chlorobenzene	22.48	1.0	20	0	112	76 - 113				
Chloroethane	18.82	1.0	20	0	94.1	70 - 130				
Chloroform	20.57	1.0	20	0	103	71 - 121				
Chloromethane	18.22	1.0	20	0	91.1	70 - 129				
cis-1,2-Dichloroethene	21.8	1.0	20	0	109	75 - 122				
cis-1,3-Dichloropropene	23.68	1.0	20	0	118	73 - 127				
Dibromochloromethane	21.85	1.0	20	0	109	77 - 122				
Dibromomethane	22.8	1.0	20	0	114	78 - 121				
Dichlorodifluoromethane	16.02	1.0	20	0	80.1	70 - 130				
Ethylbenzene	23.45	1.0	20	0	117	77 - 117				S
Hexachlorobutadiene	20.75	1.0	20	0	104	70 - 130				
Isopropylbenzene	21.35	1.0	20	0	107	73 - 127				
m,p-Xylene	48.78	2.0	40	0	122	77 - 122				
Methylene chloride	21.65	2.0	20	0	108	70 - 127				
Naphthalene	19.4	1.0	20	0	97.0	70 - 130				
n-Butylbenzene	21.53	1.0	20	0	108	72 - 130				
n-Propylbenzene	22.93	1.0	20	0	115	73 - 124				
o-Xylene	23.76	1.0	20	0	119	75 - 119				
sec-Butylbenzene	19.62	1.0	20	0	98.1	73 - 128				
Styrene	22.74	1.0	20	0	114	72 - 126				
tert-Butylbenzene	22.15	1.0	20	0	111	73 - 124				
Tetrachloroethene	21.25	1.0	20	0	106	76 - 119				
Toluene	21.16	1.0	20	0	106	77 - 118				
trans-1,2-Dichloroethene	22.17	1.0	20	0	111	72 - 127				
trans-1,3-Dichloropropene	23.72	1.0	20	0	119	77 - 119				
Trichloroethene	23.1	1.0	20	0	115	77 - 121				
Trichlorofluoromethane	20.46	1.0	20	0	102	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*46.15*	*1.0*	*50*	*0*	*92.3*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.86*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.17*	*1.0*	*50*	*0*	*94.3*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181018** Units: **ug/L** Analysis Date: **19-Oct-2018 03:01**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781184** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.26*	*1.0*	*50*	*0*	*90.5*	*81 - 120*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** 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	19.93	1.0	20	0	99.6	70 - 120				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.3	70 - 130				
1,1,2,2-Tetrachloroethane	16.62	1.0	20	0	83.1	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	21.64	1.0	20	0	108	70 - 130				
1,1,2-Trichloroethane	19.52	1.0	20	0	97.6	70 - 117				
1,1-Dichloroethane	19.44	1.0	20	0	97.2	70 - 127				
1,1-Dichloroethene	20.24	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	22.55	1.0	20	0	113	70 - 129				
1,2,3-Trichlorobenzene	16.48	1.0	20	0	82.4	70 - 130				
1,2,3-Trichloropropane	16.73	1.0	20	0	83.6	70 - 130				
1,2,4-Trichlorobenzene	17.65	1.0	20	0	88.3	70 - 125				
1,2,4-Trimethylbenzene	19.83	1.0	20	0	99.2	70 - 125				
1,2-Dibromo-3-chloropropane	14.87	1.0	20	0	74.4	70 - 130				
1,2-Dibromoethane	19.89	1.0	20	0	99.5	70 - 124				
1,2-Dichlorobenzene	18.74	1.0	20	0	93.7	70 - 115				
1,2-Dichloroethane	19.14	1.0	20	0	95.7	70 - 127				
1,2-Dichloropropane	20.52	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	18.38	1.0	20	0	91.9	70 - 126				
1,3-Dichlorobenzene	18.85	1.0	20	0	94.2	70 - 119				
1,3-Dichloropropane	19.64	1.0	20	0	98.2	70 - 121				
1,4-Dichlorobenzene	19.01	1.0	20	0	95.1	70 - 114				
2,2-Dichloropropane	20.09	1.0	20	0	100	70 - 130				
2-Butanone	34.38	2.0	40	0	86.0	70 - 130				
2-Chlorotoluene	20.71	1.0	20	0	104	70 - 130				
2-Hexanone	34.15	2.0	40	0	85.4	70 - 130				
4-Chlorotoluene	20.55	1.0	20	0	103	70 - 130				
4-Isopropyltoluene	17.83	1.0	20	0	89.2	70 - 130				
4-Methyl-2-pentanone	36.27	2.0	40	0	90.7	70 - 130				
Acetone	35.8	2.0	40	0	89.5	70 - 130				
Benzene	20.48	1.0	20	0	102	70 - 127				
Bromobenzene	19.06	1.0	20	0	95.3	70 - 115				
Bromochloromethane	19.62	1.0	20	0	98.1	70 - 127				
Bromodichloromethane	20.37	1.0	20	0	102	70 - 124				
Bromoform	18.57	1.0	20	0	92.9	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	23.12	1.0	20	0	116	70 - 130				
Carbon disulfide	39.49	2.0	40	0	98.7	70 - 130				
Carbon tetrachloride	21.31	1.0	20	0	107	70 - 130				
Chlorobenzene	20.51	1.0	20	0	103	70 - 114				
Chloroethane	19.96	1.0	20	0	99.8	70 - 130				
Chloroform	18.95	1.0	20	0	94.7	70 - 125				
Chloromethane	16.31	1.0	20	0	81.5	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	21.1	1.0	20	0	106	70 - 125				
Dibromochloromethane	19.32	1.0	20	0	96.6	70 - 124				
Dibromomethane	20.47	1.0	20	0	102	70 - 124				
Dichlorodifluoromethane	16.46	1.0	20	0	82.3	70 - 130				
Ethylbenzene	22.32	1.0	20	0	112	70 - 124				
Hexachlorobutadiene	18.59	1.0	20	0	92.9	70 - 130				
Isopropylbenzene	19.83	1.0	20	0	99.2	70 - 130				
m,p-Xylene	44.08	2.0	40	0	110	70 - 130				
Methylene chloride	19.79	2.0	20	0	99.0	70 - 128				
Naphthalene	14.85	1.0	20	0	74.2	70 - 130				
n-Butylbenzene	19.62	1.0	20	0	98.1	70 - 130				
n-Propylbenzene	21.13	1.0	20	0	106	70 - 130				
o-Xylene	21.69	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.74	1.0	20	0	93.7	70 - 130				
Styrene	19.72	1.0	20	0	98.6	70 - 130				
tert-Butylbenzene	20.67	1.0	20	0	103	70 - 130				
Tetrachloroethene	20.42	1.0	20	0	102	70 - 130				
Toluene	20.05	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	20.57	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	21.52	1.0	20	0	108	70 - 121				
Trichloroethene	21.28	1.0	20	0	106	70 - 129				
Trichlorofluoromethane	21.09	1.0	20	0	105	70 - 130				
Vinyl chloride	20.12	1.0	20	0	101	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.12*	*1.0*	*50*	*0*	*94.2*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.83*	*1.0*	*50*	*0*	*104*	*81 - 113*				
Surr: Dibromofluoromethane	*47.28*	*1.0*	*50*	*0*	*94.6*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100726-02MS** Units: **ug/L** Analysis Date: **19-Oct-2018 05:28**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781190** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** 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	19.67	1.0	20	0	98.3	70 - 120	19.93	1.3	20	
1,1,1-Trichloroethane	18.24	1.0	20	0	91.2	70 - 130	19.47	6.49	20	
1,1,2,2-Tetrachloroethane	15.89	1.0	20	0	79.5	70 - 123	16.62	4.49	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	19.82	1.0	20	0	99.1	70 - 130	21.64	8.76	20	
1,1,2-Trichloroethane	19.13	1.0	20	0	95.7	70 - 117	19.52	2	20	
1,1-Dichloroethane	18.24	1.0	20	0	91.2	70 - 127	19.44	6.36	20	
1,1-Dichloroethene	18.81	1.0	20	0	94.0	70 - 130	20.24	7.34	20	
1,1-Dichloropropene	20.91	1.0	20	0	105	70 - 129	22.55	7.55	20	
1,2,3-Trichlorobenzene	16.77	1.0	20	0	83.8	70 - 130	16.48	1.73	20	
1,2,3-Trichloropropane	16.43	1.0	20	0	82.1	70 - 130	16.73	1.82	20	
1,2,4-Trichlorobenzene	17.98	1.0	20	0	89.9	70 - 125	17.65	1.85	20	
1,2,4-Trimethylbenzene	19.53	1.0	20	0	97.7	70 - 125	19.83	1.53	20	
1,2-Dibromo-3-chloropropane	14.25	1.0	20	0	71.3	70 - 130	14.87	4.25	20	
1,2-Dibromoethane	19.34	1.0	20	0	96.7	70 - 124	19.89	2.81	20	
1,2-Dichlorobenzene	18.24	1.0	20	0	91.2	70 - 115	18.74	2.71	20	
1,2-Dichloroethane	19.32	1.0	20	0	96.6	70 - 127	19.14	0.916	20	
1,2-Dichloropropane	20.11	1.0	20	0	101	70 - 122	20.52	1.99	20	
1,3,5-Trimethylbenzene	17.6	1.0	20	0	88.0	70 - 126	18.38	4.3	20	
1,3-Dichlorobenzene	18.73	1.0	20	0	93.6	70 - 119	18.85	0.636	20	
1,3-Dichloropropane	18.95	1.0	20	0	94.7	70 - 121	19.64	3.62	20	
1,4-Dichlorobenzene	18.82	1.0	20	0	94.1	70 - 114	19.01	1.04	20	
2,2-Dichloropropane	18.81	1.0	20	0	94.0	70 - 130	20.09	6.58	20	
2-Butanone	34.35	2.0	40	0	85.9	70 - 130	34.38	0.0911	20	
2-Chlorotoluene	19.91	1.0	20	0	99.6	70 - 130	20.71	3.92	20	
2-Hexanone	34.65	2.0	40	0	86.6	70 - 130	34.15	1.46	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.55	2.26	20	
4-Isopropyltoluene	17.1	1.0	20	0	85.5	70 - 130	17.83	4.21	20	
4-Methyl-2-pentanone	35.68	2.0	40	0	89.2	70 - 130	36.27	1.63	20	
Acetone	32.18	2.0	40	0	80.4	70 - 130	35.8	10.7	20	
Benzene	19.68	1.0	20	0	98.4	70 - 127	20.48	3.98	20	
Bromobenzene	18.59	1.0	20	0	93.0	70 - 115	19.06	2.49	20	
Bromochloromethane	19.83	1.0	20	0	99.1	70 - 127	19.62	1.07	20	
Bromodichloromethane	19.79	1.0	20	0	98.9	70 - 124	20.37	2.89	20	
Bromoform	18.27	1.0	20	0	91.3	70 - 129	18.57	1.65	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325772 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.98	1.0	20	0	105	70 - 130	23.12	9.72	20	
Carbon disulfide	36.19	2.0	40	0	90.5	70 - 130	39.49	8.72	20	
Carbon tetrachloride	20.74	1.0	20	0	104	70 - 130	21.31	2.73	20	
Chlorobenzene	19.53	1.0	20	0	97.6	70 - 114	20.51	4.92	20	
Chloroethane	18.48	1.0	20	0	92.4	70 - 130	19.96	7.72	20	
Chloroform	18.47	1.0	20	0	92.4	70 - 125	18.95	2.55	20	
Chloromethane	15.83	1.0	20	0	79.1	70 - 130	16.31	3.01	20	
cis-1,2-Dichloroethene	19.71	1.0	20	0	98.5	70 - 128	20.24	2.69	20	
cis-1,3-Dichloropropene	20.74	1.0	20	0	104	70 - 125	21.1	1.73	20	
Dibromochloromethane	18.89	1.0	20	0	94.5	70 - 124	19.32	2.25	20	
Dibromomethane	20.01	1.0	20	0	100	70 - 124	20.47	2.29	20	
Dichlorodifluoromethane	14.34	1.0	20	0	71.7	70 - 130	16.46	13.8	20	
Ethylbenzene	20.91	1.0	20	0	105	70 - 124	22.32	6.53	20	
Hexachlorobutadiene	17.83	1.0	20	0	89.2	70 - 130	18.59	4.17	20	
Isopropylbenzene	18.68	1.0	20	0	93.4	70 - 130	19.83	5.99	20	
m,p-Xylene	41.93	2.0	40	0	105	70 - 130	44.08	5	20	
Methylene chloride	19.21	2.0	20	0	96.1	70 - 128	19.79	2.98	20	
Naphthalene	15.43	1.0	20	0	77.2	70 - 130	14.85	3.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.62	3.74	20	
n-Propylbenzene	19.91	1.0	20	0	99.6	70 - 130	21.13	5.92	20	
o-Xylene	20.75	1.0	20	0	104	70 - 124	21.69	4.43	20	
sec-Butylbenzene	17.69	1.0	20	0	88.5	70 - 130	18.74	5.72	20	
Styrene	19.17	1.0	20	0	95.8	70 - 130	19.72	2.83	20	
tert-Butylbenzene	19.41	1.0	20	0	97.1	70 - 130	20.67	6.26	20	
Tetrachloroethene	19.01	1.0	20	0	95.0	70 - 130	20.42	7.18	20	
Toluene	18.86	1.0	20	0	94.3	70 - 123	20.05	6.11	20	
trans-1,2-Dichloroethene	19.55	1.0	20	0	97.8	70 - 130	20.57	5.06	20	
trans-1,3-Dichloropropene	21.15	1.0	20	0	106	70 - 121	21.52	1.72	20	
Trichloroethene	20.09	1.0	20	0	100	70 - 129	21.28	5.75	20	
Trichlorofluoromethane	19.62	1.0	20	0	98.1	70 - 130	21.09	7.23	20	
Vinyl chloride	18.52	1.0	20	0	92.6	70 - 130	20.12	8.3	20	
Surr: 1,2-Dichloroethane-d4	*46.4*	*1.0*	*50*	*0*	*92.8*	*70 - 126*	*47.12*	*1.54*	*20*	
Surr: 4-Bromofluorobenzene	*50.76*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.83*	*2.1*	*20*	
Surr: Dibromofluoromethane	*46.93*	*1.0*	*50*	*0*	*93.9*	*77 - 123*	*47.28*	*0.751*	*20*	

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325772 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100726-02MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 05:52**
Client ID: Run ID: **VOA2_325772** SeqNo: **4781191** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.83*	*1.0*	*50*	*0*	*89.7*	*82 - 127*	*44.83*	*0.00577*	*20*	

The following samples were analyzed in this batch: HS18100727-01 HS18100727-02 HS18100727-03 HS18100727-04

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** 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

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** 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	*45.18*	*1.0*	*50*	*0*	*90.4*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.92*	*1.0*	*50*	*0*	*97.8*	*82 - 115*				
Surr: Dibromofluoromethane	*48*	*1.0*	*50*	*0*	*96.0*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 15:34**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782254** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.88*	*1.0*	*50*	*0*	*91.8*	*81 - 120*				

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** 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	21.75	1.0	20	0	109	77 - 118				
1,1,1-Trichloroethane	19.47	1.0	20	0	97.4	70 - 130				
1,1,2,2-Tetrachloroethane	19.27	1.0	20	0	96.4	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.29	1.0	20	0	111	70 - 130				
1,1,2-Trichloroethane	21.3	1.0	20	0	107	77 - 113				
1,1-Dichloroethane	20.01	1.0	20	0	100	71 - 122				
1,1-Dichloroethene	20.15	1.0	20	0	101	70 - 130				
1,1-Dichloropropene	21.55	1.0	20	0	108	78 - 118				
1,2,3-Trichlorobenzene	20.5	1.0	20	0	103	70 - 130				
1,2,3-Trichloropropane	19.93	1.0	20	0	99.7	70 - 127				
1,2,4-Trichlorobenzene	20.89	1.0	20	0	104	77 - 126				
1,2,4-Trimethylbenzene	21.83	1.0	20	0	109	73 - 121				
1,2-Dibromo-3-chloropropane	19.8	1.0	20	0	99.0	70 - 130				
1,2-Dibromoethane	21.98	1.0	20	0	110	76 - 123				
1,2-Dichlorobenzene	20.64	1.0	20	0	103	77 - 113				
1,2-Dichloroethane	21.37	1.0	20	0	107	70 - 124				
1,2-Dichloropropane	21.87	1.0	20	0	109	72 - 119				
1,3,5-Trimethylbenzene	19.61	1.0	20	0	98.1	75 - 118				
1,3-Dichlorobenzene	20.77	1.0	20	0	104	78 - 118				
1,3-Dichloropropane	21.46	1.0	20	0	107	75 - 116				
1,4-Dichlorobenzene	20.68	1.0	20	0	103	79 - 113				
2,2-Dichloropropane	23.09	1.0	20	0	115	70 - 130				
2-Butanone	43.1	2.0	40	0	108	70 - 130				
2-Chlorotoluene	21.68	1.0	20	0	108	70 - 128				
2-Hexanone	44.08	2.0	40	0	110	70 - 130				
4-Chlorotoluene	22.11	1.0	20	0	111	74 - 126				
4-Isopropyltoluene	19.02	1.0	20	0	95.1	74 - 126				
4-Methyl-2-pentanone	44.25	2.0	40	0	111	70 - 130				
Acetone	43.75	2.0	40	0	109	70 - 130				
Benzene	21.17	1.0	20	0	106	74 - 120				
Bromobenzene	20.29	1.0	20	0	101	78 - 113				
Bromochloromethane	20.85	1.0	20	0	104	76 - 124				
Bromodichloromethane	21.72	1.0	20	0	109	74 - 122				
Bromoform	21.81	1.0	20	0	109	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.93	1.0	20	0	125	70 - 130				
Carbon disulfide	39.37	2.0	40	0	98.4	70 - 130				
Carbon tetrachloride	19.96	1.0	20	0	99.8	71 - 125				
Chlorobenzene	21.63	1.0	20	0	108	76 - 113				
Chloroethane	20.34	1.0	20	0	102	70 - 130				
Chloroform	19.75	1.0	20	0	98.8	71 - 121				
Chloromethane	18.4	1.0	20	0	92.0	70 - 129				
cis-1,2-Dichloroethene	21.1	1.0	20	0	106	75 - 122				
cis-1,3-Dichloropropene	22.84	1.0	20	0	114	73 - 127				
Dibromochloromethane	21.45	1.0	20	0	107	77 - 122				
Dibromomethane	21.93	1.0	20	0	110	78 - 121				
Dichlorodifluoromethane	14.93	1.0	20	0	74.7	70 - 130				
Ethylbenzene	22.99	1.0	20	0	115	77 - 117				
Hexachlorobutadiene	20.85	1.0	20	0	104	70 - 130				
Isopropylbenzene	20.82	1.0	20	0	104	73 - 127				
m,p-Xylene	47.43	2.0	40	0	119	77 - 122				
Methylene chloride	21.37	2.0	20	0	107	70 - 127				
Naphthalene	19.83	1.0	20	0	99.1	70 - 130				
n-Butylbenzene	21.2	1.0	20	0	106	72 - 130				
n-Propylbenzene	22.35	1.0	20	0	112	73 - 124				
o-Xylene	23.2	1.0	20	0	116	75 - 119				
sec-Butylbenzene	19.45	1.0	20	0	97.2	73 - 128				
Styrene	21.99	1.0	20	0	110	72 - 126				
tert-Butylbenzene	21.99	1.0	20	0	110	73 - 124				
Tetrachloroethene	20.63	1.0	20	0	103	76 - 119				
Toluene	20.87	1.0	20	0	104	77 - 118				
trans-1,2-Dichloroethene	21.21	1.0	20	0	106	72 - 127				
trans-1,3-Dichloropropene	23.25	1.0	20	0	116	77 - 119				
Trichloroethene	21.88	1.0	20	0	109	77 - 121				
Trichlorofluoromethane	21.23	1.0	20	0	106	70 - 130				
Vinyl chloride	19.55	1.0	20	0	97.8	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.95*	*1.0*	*50*	*0*	*95.9*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.45*	*1.0*	*50*	*0*	*101*	*82 - 115*				
Surr: Dibromofluoromethane	*46.69*	*1.0*	*50*	*0*	*93.4*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181019** Units: **ug/L** Analysis Date: **19-Oct-2018 14:45**
Client ID: Run ID: **VOA2_325826** SeqNo: **4782252** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.49*	*1.0*	*50*	*0*	*89.0*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782259** 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	20.18	1.0	20	0	101	70 - 120				
1,1,1-Trichloroethane	19.32	1.0	20	0	96.6	70 - 130				
1,1,2,2-Tetrachloroethane	17.91	1.0	20	0	89.5	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	24.02	1.0	20	0	120	70 - 130				
1,1,2-Trichloroethane	20.01	1.0	20	0	100	70 - 117				
1,1-Dichloroethane	19.4	1.0	20	0	97.0	70 - 127				
1,1-Dichloroethene	22.7	1.0	20	3.55	95.8	70 - 130				
1,1-Dichloropropene	22.16	1.0	20	0	111	70 - 129				
1,2,3-Trichlorobenzene	17.36	1.0	20	0	86.8	70 - 130				
1,2,3-Trichloropropane	18.33	1.0	20	0	91.6	70 - 130				
1,2,4-Trichlorobenzene	18.21	1.0	20	0	91.1	70 - 125				
1,2,4-Trimethylbenzene	19.62	1.0	20	0	98.1	70 - 125				
1,2-Dibromo-3-chloropropane	17.74	1.0	20	0	88.7	70 - 130				
1,2-Dibromoethane	20.65	1.0	20	0	103	70 - 124				
1,2-Dichlorobenzene	18.6	1.0	20	0	93.0	70 - 115				
1,2-Dichloroethane	24.04	1.0	20	3.762	101	70 - 127				
1,2-Dichloropropane	20.83	1.0	20	0	104	70 - 122				
1,3,5-Trimethylbenzene	18.19	1.0	20	0	90.9	70 - 126				
1,3-Dichlorobenzene	18.98	1.0	20	0	94.9	70 - 119				
1,3-Dichloropropane	20.27	1.0	20	0	101	70 - 121				
1,4-Dichlorobenzene	18.95	1.0	20	0	94.7	70 - 114				
2,2-Dichloropropane	21.02	1.0	20	0	105	70 - 130				
2-Butanone	38.13	2.0	40	0	95.3	70 - 130				
2-Chlorotoluene	20.09	1.0	20	0	100	70 - 130				
2-Hexanone	41.2	2.0	40	0	103	70 - 130				
4-Chlorotoluene	20.48	1.0	20	0	102	70 - 130				
4-Isopropyltoluene	17.74	1.0	20	0	88.7	70 - 130				
4-Methyl-2-pentanone	41.05	2.0	40	0	103	70 - 130				
Acetone	34.42	2.0	40	0	86.0	70 - 130				
Benzene	20.81	1.0	20	0.5277	101	70 - 127				
Bromobenzene	18.59	1.0	20	0	92.9	70 - 115				
Bromochloromethane	20.15	1.0	20	0	101	70 - 127				
Bromodichloromethane	20.29	1.0	20	0	101	70 - 124				
Bromoform	20.42	1.0	20	0	102	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782259** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	21.92	1.0	20	0	110	70 - 130				
Carbon disulfide	40.63	2.0	40	0	102	70 - 130				
Carbon tetrachloride	21.78	1.0	20	0	109	70 - 130				
Chlorobenzene	20.6	1.0	20	0	103	70 - 114				
Chloroethane	21.35	1.0	20	0	107	70 - 130				
Chloroform	19	1.0	20	0	95.0	70 - 125				
Chloromethane	16.72	1.0	20	0	83.6	70 - 130				
cis-1,2-Dichloroethene	232.9	1.0	20	212.7	101	70 - 128				EO
cis-1,3-Dichloropropene	20.64	1.0	20	0	103	70 - 125				
Dibromochloromethane	19.61	1.0	20	0	98.1	70 - 124				
Dibromomethane	21.09	1.0	20	0	105	70 - 124				
Dichlorodifluoromethane	14.69	1.0	20	0	73.5	70 - 130				
Ethylbenzene	22.17	1.0	20	0	111	70 - 124				
Hexachlorobutadiene	18.11	1.0	20	0	90.6	70 - 130				
Isopropylbenzene	19.88	1.0	20	0	99.4	70 - 130				
m,p-Xylene	43.96	2.0	40	0	110	70 - 130				
Methylene chloride	19.7	2.0	20	0	98.5	70 - 128				
Naphthalene	16.84	1.0	20	0	84.2	70 - 130				
n-Butylbenzene	19.56	1.0	20	0	97.8	70 - 130				
n-Propylbenzene	20.51	1.0	20	0	103	70 - 130				
o-Xylene	21.5	1.0	20	0	108	70 - 124				
sec-Butylbenzene	18.26	1.0	20	0	91.3	70 - 130				
Styrene	20	1.0	20	0	100	70 - 130				
tert-Butylbenzene	20.09	1.0	20	0	100	70 - 130				
Tetrachloroethene	19.95	1.0	20	0	99.8	70 - 130				
Toluene	20.04	1.0	20	0	100	70 - 123				
trans-1,2-Dichloroethene	21.73	1.0	20	0	109	70 - 130				
trans-1,3-Dichloropropene	21.62	1.0	20	0	108	70 - 121				
Trichloroethene	573.1	1.0	20	561.2	59.8	70 - 129				SEO
Trichlorofluoromethane	20.48	1.0	20	0	102	70 - 130				
Vinyl chloride	23.88	1.0	20	4.474	97.0	70 - 130				
Surr: 1,2-Dichloroethane-d4	*47.93*	*1.0*	*50*	*0*	*95.9*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.6*	*1.0*	*50*	*0*	*103*	*81 - 113*				
Surr: Dibromofluoromethane	*47.71*	*1.0*	*50*	*0*	*95.4*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18100727-05MS** Units: **ug/L** Analysis Date: **19-Oct-2018 17:44**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782259** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.93*	*1.0*	*50*	*0*	*89.9*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782260** 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	19.75	1.0	20	0	98.8	70 - 120	20.18	2.13	20	
1,1,1-Trichloroethane	17.42	1.0	20	0	87.1	70 - 130	19.32	10.3	20	
1,1,2,2-Tetrachloroethane	18.3	1.0	20	0	91.5	70 - 123	17.91	2.14	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	20.52	1.0	20	0	103	70 - 130	24.02	15.7	20	
1,1,2-Trichloroethane	19.87	1.0	20	0	99.3	70 - 117	20.01	0.72	20	
1,1-Dichloroethane	19.19	1.0	20	0	96.0	70 - 127	19.4	1.06	20	
1,1-Dichloroethene	21.37	1.0	20	3.55	89.1	70 - 130	22.7	6.05	20	
1,1-Dichloropropene	20.34	1.0	20	0	102	70 - 129	22.16	8.57	20	
1,2,3-Trichlorobenzene	17.64	1.0	20	0	88.2	70 - 130	17.36	1.57	20	
1,2,3-Trichloropropane	18.31	1.0	20	0	91.5	70 - 130	18.33	0.113	20	
1,2,4-Trichlorobenzene	18.38	1.0	20	0	91.9	70 - 125	18.21	0.926	20	
1,2,4-Trimethylbenzene	19.65	1.0	20	0	98.2	70 - 125	19.62	0.144	20	
1,2-Dibromo-3-chloropropane	17.5	1.0	20	0	87.5	70 - 130	17.74	1.34	20	
1,2-Dibromoethane	20.23	1.0	20	0	101	70 - 124	20.65	2.05	20	
1,2-Dichlorobenzene	18.6	1.0	20	0	93.0	70 - 115	18.6	0.00724	20	
1,2-Dichloroethane	23.89	1.0	20	3.762	101	70 - 127	24.04	0.603	20	
1,2-Dichloropropane	19.7	1.0	20	0	98.5	70 - 122	20.83	5.58	20	
1,3,5-Trimethylbenzene	17.62	1.0	20	0	88.1	70 - 126	18.19	3.19	20	
1,3-Dichlorobenzene	18.81	1.0	20	0	94.1	70 - 119	18.98	0.881	20	
1,3-Dichloropropane	19.74	1.0	20	0	98.7	70 - 121	20.27	2.64	20	
1,4-Dichlorobenzene	18.94	1.0	20	0	94.7	70 - 114	18.95	0.0219	20	
2,2-Dichloropropane	18.98	1.0	20	0	94.9	70 - 130	21.02	10.2	20	
2-Butanone	37.77	2.0	40	0	94.4	70 - 130	38.13	0.952	20	
2-Chlorotoluene	19.64	1.0	20	0	98.2	70 - 130	20.09	2.25	20	
2-Hexanone	40.96	2.0	40	0	102	70 - 130	41.2	0.589	20	
4-Chlorotoluene	20.09	1.0	20	0	100	70 - 130	20.48	1.92	20	
4-Isopropyltoluene	17.08	1.0	20	0	85.4	70 - 130	17.74	3.8	20	
4-Methyl-2-pentanone	41.01	2.0	40	0	103	70 - 130	41.05	0.0964	20	
Acetone	39.27	2.0	40	0	98.2	70 - 130	34.42	13.2	20	
Benzene	19.75	1.0	20	0.5277	96.1	70 - 127	20.81	5.25	20	
Bromobenzene	18.67	1.0	20	0	93.4	70 - 115	18.59	0.463	20	
Bromochloromethane	19.71	1.0	20	0	98.5	70 - 127	20.15	2.25	20	
Bromodichloromethane	19.76	1.0	20	0	98.8	70 - 124	20.29	2.64	20	
Bromoform	19.86	1.0	20	0	99.3	70 - 129	20.42	2.82	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325826 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782260** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	19.91	1.0	20	0	99.6	70 - 130	21.92	9.62	20	
Carbon disulfide	37.59	2.0	40	0	94.0	70 - 130	40.63	7.77	20	
Carbon tetrachloride	20.65	1.0	20	0	103	70 - 130	21.78	5.29	20	
Chlorobenzene	19.96	1.0	20	0	99.8	70 - 114	20.6	3.11	20	
Chloroethane	20.59	1.0	20	0	103	70 - 130	21.35	3.64	20	
Chloroform	18.04	1.0	20	0	90.2	70 - 125	19	5.2	20	
Chloromethane	15.25	1.0	20	0	76.3	70 - 130	16.72	9.16	20	
cis-1,2-Dichloroethene	226.8	1.0	20	212.7	70.6	70 - 128	232.9	2.64	20	EO
cis-1,3-Dichloropropene	20.87	1.0	20	0	104	70 - 125	20.64	1.09	20	
Dibromochloromethane	19.47	1.0	20	0	97.4	70 - 124	19.61	0.734	20	
Dibromomethane	20.41	1.0	20	0	102	70 - 124	21.09	3.26	20	
Dichlorodifluoromethane	13.19	1.0	20	0	66.0	70 - 130	14.69	10.8	20	S
Ethylbenzene	21.25	1.0	20	0	106	70 - 124	22.17	4.2	20	
Hexachlorobutadiene	17.97	1.0	20	0	89.9	70 - 130	18.11	0.764	20	
Isopropylbenzene	18.93	1.0	20	0	94.7	70 - 130	19.88	4.86	20	
m,p-Xylene	42.1	2.0	40	0	105	70 - 130	43.96	4.32	20	
Methylene chloride	18.35	2.0	20	0	91.7	70 - 128	19.7	7.1	20	
Naphthalene	17.85	1.0	20	0	89.3	70 - 130	16.84	5.84	20	
n-Butylbenzene	18.9	1.0	20	0	94.5	70 - 130	19.56	3.4	20	
n-Propylbenzene	19.58	1.0	20	0	97.9	70 - 130	20.51	4.64	20	
o-Xylene	20.28	1.0	20	0	101	70 - 124	21.5	5.87	20	
sec-Butylbenzene	17.48	1.0	20	0	87.4	70 - 130	18.26	4.4	20	
Styrene	19.66	1.0	20	0	98.3	70 - 130	20	1.72	20	
tert-Butylbenzene	19.54	1.0	20	0	97.7	70 - 130	20.09	2.76	20	
Tetrachloroethene	18.79	1.0	20	0	94.0	70 - 130	19.95	5.97	20	
Toluene	18.93	1.0	20	0	94.6	70 - 123	20.04	5.7	20	
trans-1,2-Dichloroethene	20.47	1.0	20	0	102	70 - 130	21.73	5.95	20	
trans-1,3-Dichloropropene	21.43	1.0	20	0	107	70 - 121	21.62	0.868	20	
Trichloroethene	549.7	1.0	20	561.2	-57.6	70 - 129	573.1	4.18	20	SEO
Trichlorofluoromethane	18.47	1.0	20	0	92.3	70 - 130	20.48	10.3	20	
Vinyl chloride	21.31	1.0	20	4.474	84.2	70 - 130	23.88	11.4	20	
Surr: 1,2-Dichloroethane-d4	*47.26*	*1.0*	*50*	*0*	*94.5*	*70 - 126*	*47.93*	*1.42*	*20*	
Surr: 4-Bromofluorobenzene	*50.98*	*1.0*	*50*	*0*	*102*	*81 - 113*	*51.6*	*1.21*	*20*	
Surr: Dibromofluoromethane	*47.27*	*1.0*	*50*	*0*	*94.5*	*77 - 123*	*47.71*	*0.931*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325826 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100727-05MSD** Units: **ug/L** Analysis Date: **19-Oct-2018 18:09**
Client ID: **16WW40-181012** Run ID: **VOA2_325826** SeqNo: **4782260** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.75*	*1.0*	*50*	*0*	*89.5*	*82 - 127*	*44.93*	*0.394*	*20*	

The following samples were analyzed in this batch:

HS18100727-05	HS18100727-06	HS18100727-07	HS18100727-08
HS18100727-09	HS18100727-10	HS18100727-11	HS18100727-12

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325844 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181020** Units: **ug/L** Analysis Date: **20-Oct-2018 12:29**
Client ID: Run ID: **VOA2_325844** SeqNo: **4782667** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Trichloroethene	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*44.64*	*1.0*	*50*	*0*	*89.3*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*48.17*	*1.0*	*50*	*0*	*96.3*	*82 - 115*				
Surr: Dibromofluoromethane	*48.88*	*1.0*	*50*	*0*	*97.8*	*73 - 126*				
Surr: Toluene-d8	*46.85*	*1.0*	*50*	*0*	*93.7*	*81 - 120*				

LCS Sample ID: **VLCSW-181020** Units: **ug/L** Analysis Date: **20-Oct-2018 12:04**
Client ID: Run ID: **VOA2_325844** SeqNo: **4782666** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Trichloroethene	21.37	1.0	20	0	107	77 - 121				
Surr: 1,2-Dichloroethane-d4	*46.04*	*1.0*	*50*	*0*	*92.1*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.61*	*1.0*	*50*	*0*	*101*	*82 - 115*				
Surr: Dibromofluoromethane	*47.06*	*1.0*	*50*	*0*	*94.1*	*73 - 126*				
Surr: Toluene-d8	*45.39*	*1.0*	*50*	*0*	*90.8*	*81 - 120*				

MS Sample ID: **HS18100713-03MS** Units: **ug/L** Analysis Date: **20-Oct-2018 16:38**
Client ID: Run ID: **VOA2_325844** SeqNo: **4782671** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Trichloroethene	22.55	1.0	20	0	113	70 - 129				
Surr: 1,2-Dichloroethane-d4	*47.33*	*1.0*	*50*	*0*	*94.7*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.42*	*1.0*	*50*	*0*	*101*	*81 - 113*				
Surr: Dibromofluoromethane	*47.83*	*1.0*	*50*	*0*	*95.7*	*77 - 123*				
Surr: Toluene-d8	*45.27*	*1.0*	*50*	*0*	*90.5*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: **R325844 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18100713-03MSD** Units: **ug/L** Analysis Date: **20-Oct-2018 17:02**
Client ID: Run ID: **VOA2_325844** SeqNo: **4782672** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Trichloroethene	20.75	1.0	20	0	104	70 - 129	22.55	8.31	20	
Surr: 1,2-Dichloroethane-d4	*46.86*	*1.0*	*50*	*0*	*93.7*	*70 - 126*	*47.33*	*0.999*	*20*	
Surr: 4-Bromofluorobenzene	*51.58*	*1.0*	*50*	*0*	*103*	*81 - 113*	*50.42*	*2.28*	*20*	
Surr: Dibromofluoromethane	*47.15*	*1.0*	*50*	*0*	*94.3*	*77 - 123*	*47.83*	*1.44*	*20*	
Surr: Toluene-d8	*45.62*	*1.0*	*50*	*0*	*91.2*	*82 - 127*	*45.27*	*0.751*	*20*	

The following samples were analyzed in this batch: HS18100727-07 HS18100727-11

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18100727

QC BATCH REPORT

Batch ID: R325666 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:03**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777661** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U

LCS Sample ID: **WLCSW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:18**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777662** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.648	0.100	4	0	91.2	80 - 120				

LCSD Sample ID: **WLCSDW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:32**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777663** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.65	0.100	4	0	91.2	80 - 120	3.648	0.0548	20	

MS Sample ID: **HS18100727-05MS** Units: **mg/L** Analysis Date: **17-Oct-2018 08:22**
Client ID: **16WW40-181012** Run ID: **ICS2100_325666** SeqNo: **4777687** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.55	1.00	20	5.566	89.9	80 - 120				

MSD Sample ID: **HS18100727-05MSD** Units: **mg/L** Analysis Date: **17-Oct-2018 08:36**
Client ID: **16WW40-181012** Run ID: **ICS2100_325666** SeqNo: **4777688** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.94	1.00	20	5.566	91.8	80 - 120	23.55	1.62	20	

The following samples were analyzed in this batch:

HS18100727-02	HS18100727-05	HS18100727-06	HS18100727-08
HS18100727-09	HS18100727-10	HS18100727-11	HS18100727-12

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS18100727**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18100727

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18100727-01	16TB05-181012	Login	10/13/2018 5:09:13 PM	PJM	VOA259
HS18100727-02	16WW30-181012	Login	10/13/2018 5:09:13 PM	PJM	Sub
HS18100727-02	16WW30-181012	Login	10/13/2018 5:09:13 PM	PJM	VOA259

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100727

Date/Time Received: **13-Oct-2018 09:40**
Received by: **PJM**

Checklist completed by: *Pablo Marinez* eSignature 13-Oct-2018 Date

Reviewed by: *RJ Modashia* eSignature 15-Oct-2018 Date

Matrices: **WATER**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.3C/1.0C UC/C	IR # 25
Cooler(s)/Kit(s):	44084	
Date/Time sample(s) sent to storage:	10/13/2018 17:00	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181012 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO			
Facility Name	Longhorn AAP		
Project Number	501032		
	LHAAP-50		
Address	1203-B East Grand Avenue		
	PMB 202		
City	Marshall	State	TX
Postal Code	75670	Country	USA
Phone Number	713.243.7264		
Project Manager	Praveen Srivastav		

LABORATORY			
Lab Name	ALS Laboratories		
Lab Contact	RJ Modashia		
Email	RJ.Modashia@alsglobal.com		
Address	10450 Stancliff Rd., Suite 210		
City	Houston	State	TX
Postal Code	77099	Country	USA
Phone Number	281.575.2279 or 281.530.5656		

OTHER INFO			
Email Invoice To	FedInvoices@aptim.com		
Email Report To	kim.napier@aptim.com		
Mail Reports To	Kim Napier		
Address	2410 Cherahala Blvd.		
City	Knoxville	State	TN
Postal Code	37932	Country	USA
Shipping Company	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060
16TB05-181012	FIELD QC				LIQ	10/12/2018	830	2		2					
16WW30-181012	16WW30	9.27	9.62	FT	GW	10/12/2018	1030	5		3	1		1		
16WW46-181012	16WW46	15.83	16.09	FT	GW	10/12/2018	1105	4		3	1				
16WW23-181012	16WW23	9.23	9.64	FT	GW	10/12/2018	1155	4		3	1				
16WW40-181012	16WW40	12.31	12.56	FT	GW	10/12/2018	1235	5		3	1		1		
16WW40-181012--FD	16WW40	12.31	12.56	FT	GW	10/12/2018	1235	5		3	1		1		
16WW40-181012-MS	16WW40	12.31	12.56	FT	GW	10/12/2018	1235	5		3	1		1		
16WW40-181012-MSD	16WW40	12.31	12.56	FT	GW	10/12/2018	1235	5		3	1		1		
16WW27-181012	16WW27	8.91	9.32	FT	GW	10/12/2018	1310	4		3	1				
16WW12-181012	16WW12	18.63	18.78	FT	GW	10/12/2018	1350	5		3	1		1		
16WW42-181012	16WW42	10.95	12.24	FT	GW	10/12/2018	1425	5		3	1		1		
16WW13-181012	16WW13	9.06	10.07	FT	GW	10/12/2018	1515	5		3	1		1		
16WW21-181012	16WW21	26.75	26.9	FT	GW	10/12/2018	1540	5		3	1		1		
16EB01-181012	FIELD QC			FT	GW	10/12/2018	1630	5		3	1		1		

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant
HS18100727

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible] APTIM	10-12-18/1810	ALS PM	10-13-18 9:40
16EB01-181012 is an equipment rinse sample and is not field filtered for perechlorate.				

44084 VC IR CF

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CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

FedEx
TRK# 4380 9533 1366
SATURDAY 12:00P
PRIORITY OVERNIGHT
XO SGRA
77099
TX-US IAH

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

CUSTODY SEAL
DATE: 10-12-18
Signature:
LHAAP

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828987; 1828988; 1828989; 1829115

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2159 (225647)

General Set Information: There were eighteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly.

Method QC data: The method blank (LMB 624449) was less than 1/2 the CRDL. The recovery for the LCS (624450) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected. The relative percent differences (RPD's) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 25, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 29, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1828989**
Project ID: HS18100727 101218
Purchase Order: HS18100727
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW30-181012	1828989001	10/12/18	10/16/18	
16WW46-181012	1828989002	10/12/18	10/16/18	
16WW23-181012	1828989003	10/12/18	10/16/18	
16WW40-181012	1828989004	10/12/18	10/16/18	
16WW40-181012-FD	1828989007	10/12/18	10/16/18	
16WW27-181012	1828989008	10/12/18	10/16/18	
16WW12-181012	1828989009	10/12/18	10/16/18	
16WW42-181012	1828989010	10/12/18	10/16/18	
16WW13-181012	1828989011	10/12/18	10/16/18	
16WW21-181012	1828989012	10/12/18	10/16/18	
16EB01-181012	1828989013	10/12/18	10/16/18	

Client QC ID *	Lab ID	Collect Date	Receive Date	Sampling Site
16WW40-181012MS	1828989005	10/12/18	10/16/18	
16WW40-181012MSD	1828989006	10/12/18	10/16/18	

***Client QC is reported as part of the Quality Control results report, if requested.**

ANALYTICAL REPORT

Workorder: 34-1828989
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW30-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989001 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 11:05
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW46-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989002 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 11:19
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW23-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989003 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 11:33
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW40-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989004 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2159 (HBN: 225647)
Analyzed: 10/24/2018 11:47
Instrument ID: LCMS04
Percent Solid: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

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ANALYTICAL REPORT

Workorder: 34-1828989
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW40-181012-FD** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989007 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 12:58 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW27-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989008 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 13:12 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW12-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989009 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 13:26 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**12**	1.0	2.0	4.0	1	

Sample ID: **16WW42-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989010 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 13:40 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

ANALYTICAL REPORT

Workorder: 34-1828989
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW13-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989011 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 13:54 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW21-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989012 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 14:09 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16EB01-181012** | Sampling Site: NA | Collected: 10/12/2018
Lab ID: 1828989013 | Media: 125 mL Nalgene | Received: 10/16/2018
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2159 (HBN: 225647) | **Percent Solid:** NA
Analyzed: 10/24/2018 14:23 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/25/2018 14:54	/S/ Stephen Brose 10/29/2018 08:45

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1828989
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1828989

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2159 (HBN: 225647)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Blank

LMB: 624449
Analyzed: 10/24/2018 08:55
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 624450
Analyzed: 10/24/2018 09:09
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.90	5.00	97.9	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828988001		MS: 1828988002					MSD: 1828988003				
Analyzed: 10/24/2018 09:40		Analyzed: 10/24/2018 09:54					Analyzed: 10/24/2018 10:08				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	4.75	5	94.9	78.8	123.8	4.67	93.3	1.7	0.0	20.0

Sample: 1828989004		MS: 1828989005					MSD: 1828989006				
Analyzed: 10/24/2018 11:47		Analyzed: 10/24/2018 12:29					Analyzed: 10/24/2018 12:43				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	5.4	5	108	78.8	123.8	6.26	# 125	14.7	0.0	20.0

Continuing Calibration Verification

CCV: 624446				CCV: 624451			CCV: 624453		
Analyzed: 10/24/2018 08:12				Analyzed: 10/24/2018 12:01			Analyzed: 10/24/2018 15:06		
Units: ug/L				Units: ug/L			Units: ug/L		
Criteria: ± 15%				Criteria: ± 15%			Criteria: ± 15%		
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	24.4	25.0	97.6	23.5	25.0	94.0	23.5	25.0	94.2

Interference Check Sample

ICSA: 624448
Analyzed: 10/24/2018 08:41
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	0.985	1.00	98.5

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1828989**

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2159 (HBN: 225647)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Limit of Detection Verification

LODV:	624447			**LODV:**	624452		**LODV:**	624454	
Analyzed:	10/24/2018 08:27			**Analyzed:**	10/24/2018 12:15		**Analyzed:**	10/24/2018 15:20	
Units:	ug/L			**Units:**	ug/L		**Units:**	ug/L	
Criteria:	± 50%			**Criteria:**	± 50%		**Criteria:**	± 50%	
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	1.03	1.00	103	0.970	1.00	97.0	1.02	1.00	102

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/25/2018 14:54	10/29/2018 08:45

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

1828989

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: 10013

1828989

SUBCONTRACT TO:

ALS Laboratory Group
960 West LeVoy Drive
Salt Lake City, UT 84123

Phone: +1 800 356 9135

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: HS18100727
TSR: Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100727-02**	**16WW30-181012**	**GW**	**12 Oct 2018 10:30**
	SUB_Perch-6850			23 Oct 2018
2.	**HS18100727-03**	**16WW46-181012**	**GW**	**12 Oct 2018 11:05**
	SUB_Perch-6850			23 Oct 2018
3.	**HS18100727-04**	**16WW23-181012**	**GW**	**12 Oct 2018 11:55**
	SUB_Perch-6850			23 Oct 2018
4.	**HS18100727-05**	**16WW40-181012**	**GW**	**12 Oct 2018 12:35**
	SUB_Perch-6850			23 Oct 2018
5.	**HS18100727-06**	**16WW40-181012-FD**	**GW**	**12 Oct 2018 12:35**
	SUB_Perch-6850			23 Oct 2018
6.	**HS18100727-07**	**16WW27-181012**	**GW**	**12 Oct 2018 13:10**
	SUB_Perch-6850			23 Oct 2018
7.	**HS18100727-08**	**16WW12-181012**	**GW**	**12 Oct 2018 13:50**
	SUB_Perch-6850			23 Oct 2018
8.	**HS18100727-09**	**16WW42-181012**	**GW**	**12 Oct 2018 14:25**
	SUB_Perch-6850			23 Oct 2018
9.	**HS18100727-10**	**16WW13-181012**	**GW**	**12 Oct 2018 15:15**

Extra volume MS/MSD

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Subcontract Chain of Custody

COC ID: 10013

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
	SUB_Perch-6850			23 Oct 2018
10.	**HS18100727-11**	**16WW21-181012**	**GW**	**12 Oct 2018 15:40**
	SUB_Perch-6850			23 Oct 2018
11.	**HS18100727-12**	**16EB01-181012**	**GW**	**12 Oct 2018 16:30**
	SUB_Perch-6850			23 Oct 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: 10/15/18 1800

Received By: _____ Date/Time: 10/16/2018 10:20

Cooler ID(s): _____ Temperature(s): _____

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100727	Split:	Workorder ID: 1828989	Level: ENV_LVL4
Client: ALS Environmental (Houston)		Account: 8101	Type: 125Poly
Comments:			Preservatives: COOL

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	Requested Analysis: EPA 6850, DoD QSM
1	10/12/2018 10:30	16WW30-181012	1828989001		Water	A	1	A
2	10/12/2018 11:05	16WW46-181012	1828989002		Water	A	1	A
3	10/12/2018 11:55	16WW23-181012	1828989003		Water	A	1	A
4	10/12/2018 12:35	16WW40-181012	1828989004		Water	A	1	A
5	10/12/2018 12:35	16WW40-181012MS	1828989005	MS	Water	A	1	A
6	10/12/2018 12:35	16WW40-181012MSD	1828989006	MSD	Water	A	1	A
7	10/12/2018 12:35	16WW40-181012-FD	1828989007	FLDDUP	Water	A	1	A
8	10/12/2018 13:10	16WW27-181012	1828989008		Water	A	1	A
9	10/12/2018 13:50	16WW12-181012	1828989009		Water	A	1	A
10	10/12/2018 14:25	16WW42-181012	1828989010		Water	A	1	A

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/16/2018 10:20	ALS Sample Receiving	Sample Login
Julie Warath	10/17/18 1000	3C	storage
R.33.1	10-23-18/14:10	T. Bush	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

Tue, 10/16/18 1:11 PM

ALSCOCV3.1

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100727	Split:	Workorder ID: 1828989	Level: ENV_LVL4
Client: ALS Environmental (Houston)		Account: 8101	Type: 125Poly
Comments:			Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
11	10/12/2018 15:15	16WW13-181012	1828989011		Water	A	1	A
12	10/12/2018 15:40	16WW21-181012	1828989012		Water	A	1	A
13	10/12/2018 16:30	16EB01-181012	1828989013	EQBK	Water	A	1	A
14								
15								
16								
17								
18								
19								
20								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/16/2018 10:20	ALS Sample Receiving	Sample Login
Julie Warath	10/17/18 1000	3C	Storage
R 33.1	10/23/18 14:10	T. Bush	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

1828989

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: HS18100727 / 10013

Date/Time of Receipt: 10/16/2018 10:20

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8830	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Desinee Hill (Signature) Desinee Hill (Printed Name) 10/16/2018 (Date)

CLIENT-RELATED INFORMATION

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Residual Chlorine Present
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain of Custody Problems
- ☐ Other:

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Received 3 bottles for sample HS18100727-05

Client Notified? YES ☐ No ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Part # 159469-43P AU12 EXP 07/18

Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT.
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 15OCT18
ACTWGT: 22.55 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

TO **SAMPLE RECEIVING**
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18100725/726/727 – RJ

FedEx Express

TRK# 0201 **4380 9533 6070**

TUE – 16 OCT 3:00P
STANDARD OVERNIGHT

AX BTFA

84123
UT-US **SLC**

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Batch Worklist

Batch: ELMS/ 2159 **Created:** 10/23/2018 18:03 **Instrument:** **HBN:** 225647

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828987 [ENV_LVL4]
Workorder: 1828988 [ENV_LVL4]
Workorder: 1828989 [ENV_LVL4]
Workorder: 1829115 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	624446	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
2	624447	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
3	624448	ICS for HBN 225647 [ELMS/2159]				ICS	3		E6850..D3Q	5311		10/29/2018	
4	624449	LMB for HBN 225647 [ELMS/2159]				LMB	3		E6850Q413Q	5311		10/29/2018	
5	624450	LCS for HBN 225647 [ELMS/2159]				LCS	3		E6850Q413Q	5311		10/29/2018	
6	1828987001	16WW32-181011				SAMPLE	3	1828987001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
7	1828988001	16SW01-181011				SAMPLE	3	1828988001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
8	1828988002	16SW01-181011MS				MS	3	1828988002-A	E6850Q413Q	5480		10/29/2018	
9	1828988003	16SW01-181011MSD				MSD	3	1828988003-A	E6850Q413Q	5480		10/29/2018	
10	1828988004	16SW01-181011-FD				FLDDUP	3	1828988004-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
11	1828988005	16SW02-181011				SAMPLE	3	1828988005-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
12	1828988006	16SW03-181011				SAMPLE	3	1828988006-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
13	1828989001	16WW30-181012				SAMPLE	3	1828989001-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
14	1828989002	16WW46-181012				SAMPLE	3	1828989002-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
15	1828989003	16WW23-181012				SAMPLE	3	1828989003-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
16	1828989004	16WW40-181012				SAMPLE	3	1828989004-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
17	624451	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
18	624452	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
19	1828989005	16WW40-181012MS				MS	3	1828989005-A	E6850Q413Q	5480		10/29/2018	
20	1828989006	16WW40-181012MSD				MSD	3	1828989006-A	E6850Q413Q	5480		10/29/2018	
21	1828989007	16WW40-181012-FD				FLDDUP	3	1828989007-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
22	1828989008	16WW27-181012				SAMPLE	3	1828989008-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
23	1828989009	16WW12-181012				SAMPLE	3	1828989009-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
24	1828989010	16WW42-181012				SAMPLE	3	1828989010-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
25	1828989011	16WW13-181012				SAMPLE	3	1828989011-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
26	1828989012	16WW21-181012				SAMPLE	3	1828989012-A	E6850Q41.3	5480	11/9/2018	10/29/2018	

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Batch Worklist

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
27	1828989013	16EB01-181012				EQBK	3	1828989013-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
28	1829115001	16WW29-181015				SAMPLE	3	1829115001-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
29	1829115002	16WW55-181015				SAMPLE	3	1829115002-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
30	624453	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
31	624454	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828987 (001); 1828988 (001-06); 1828989 (001-13); 1829115 (001,02)
ELMS Batch/HBN ID: 2159 (225647)
Prep Date: 10/23/2018 Analysis Date: 10/24/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\24OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 624450; Target = 5.0µg/L. ASTM type II water was used for LMB 624449.

MS/MSD: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:

1) Results reported in µg/L. Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly. Samples 1828989004/07 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters, except for the following. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225647-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria Batch(es)/SDG: ELMS 2159 HBN 225647 Sample Set IDs if Applicable: 18-28987/18289881/18 28989/1829115	Analyst Initials	Reviewer Initials
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

T.B. 10.26.18
SB 10/29/18

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STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

RIGHT SOLUTIONS | RIGHT PARTNER

STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard: 43659
MFG: AccuStandard
MFG Lot: 218065075
Part ID: IC-PER-10X-1

Created By: Thomas Bosch
Create Date: 09/17/2018 09:09AM

Amount: 100 mL
Expires: 07/25/2020
Usable: No
Lab Lot: CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025
MFG Lot: Not Provided		**Usable:** Yes
Part ID: Not Provided		**Lab Lot:** LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK		Description - 6850 QC Stock STD 1,000ug/mL
Standard: 36748	Created By: Thomas Bosch	Amount: 100 mL
MFG: Ultra Scientific	Create Date: 05/11/2017 01:05PM	Expires: 03/31/2020
MFG Lot: CP-0860		Usable: Yes
Part ID: ICC-013		Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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ALS

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK	Description - Perchlorate ISTD Wrk 1,000ug/L

Standard:	**43730**	**Created By:**	Thomas Bosch	**Amount:**	25 mL
MFG:	ALS/SLC	**Create Date:**	09/20/2018 09:09AM	**Expires:**	09/20/2019
MFG Lot:	TNB: 05/09/2018	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Pipette ID:	Not Provided	**Verify Date:**		**Lab Lot:**	CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED REFERENCE MATERIAL PRODUCER
ANAB ACCREDITED TESTING LABORATORY

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

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125 Market Street
New Haven, CT 06513
USA

AccuStandard®

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www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

GHS

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

OR-ORG/INO-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

* *For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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10450 Stancliff Rd. Suite 210
Houston, TX 77099
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March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18100823**

Laboratory Results for: **LHAAP-16**

Dear Susan,

ALS Environmental received 10 sample(s) on Oct 16, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
Work Order: HS18100823

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18100823-01	16EW08-181013	Groundwater		13-Oct-2018 10:45	16-Oct-2018 09:15	☐
HS18100823-02	16EW07-181013	Groundwater		13-Oct-2018 11:00	16-Oct-2018 09:15	☐
HS18100823-03	16EW15-181013	Groundwater		13-Oct-2018 12:20	16-Oct-2018 09:15	☐
HS18100823-04	16EW11-181013	Groundwater		13-Oct-2018 12:55	16-Oct-2018 09:15	☐
HS18100823-05	16EW14B-181013	Groundwater		13-Oct-2018 13:20	16-Oct-2018 09:15	☐
HS18100823-06	16EW12B-181013	Groundwater		13-Oct-2018 13:30	16-Oct-2018 09:15	☐
HS18100823-07	16EW13-181013	Groundwater		13-Oct-2018 14:05	16-Oct-2018 09:15	☐
HS18100823-08	16TB06-181015	Water	VBLKW 092618-21	15-Oct-2018 08:45	16-Oct-2018 09:15	☐
HS18100823-09	16WW29-181015	Groundwater		15-Oct-2018 09:30	16-Oct-2018 09:15	☐
HS18100823-10	16WW55-181015	Groundwater		15-Oct-2018 10:30	16-Oct-2018 09:15	☐

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
Work Order: HS18100823

CASE NARRATIVE

Work Order Comments

- Revised to updated the VOC list.
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.
- The analysis for TOC was subcontracted to ALS Kelso, WA. Final report attached.

GC Semivolatiles by Method RSK-175

Batch ID: R325736

Sample ID: HS18100713-02MS

- MS and MSD are for an unrelated sample

GCMS Volatiles by Method SW8260

Batch ID: R325941

Sample ID: CCV

- Bromomethane exceeded %D limits on CCV. Samples ND.

Sample ID: HS18101139-07MS

- MS and MSD are for an unrelated sample.

WetChemistry by Method SM2320B

Batch ID: R325707

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R325666

Sample ID: HS18100727-05MSD

- MSD is for an unrelated sample (Chloride,Sulfate)

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW08-181013 Lab ID:HS18100823-01

Collection Date: 13-Oct-2018 10:45 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**1.11**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 04:00

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW07-181013 Lab ID:HS18100823-02

Collection Date: 13-Oct-2018 11:00 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.14**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 04:14

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW15-181013 Lab ID:HS18100823-03

Collection Date: 13-Oct-2018 12:20 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**1.86**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 05:56

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW11-181013 Lab ID:HS18100823-04

Collection Date: 13-Oct-2018 12:55 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**4.68**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 06:11

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	LHAAP-16	WorkOrder:HS18100823
Sample ID:	16EW14B-181013	Lab ID:HS18100823-05
Collection Date:	13-Oct-2018 13:20	Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**1.40**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 06:25

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW12B-181013 Lab ID:HS18100823-06

Collection Date: 13-Oct-2018 13:30 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**3.82**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 06:40

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.

ANALYTICAL REPORT

Project: LHAAP-16 WorkOrder:HS18100823

Sample ID: 16EW13-181013 Lab ID:HS18100823-07

Collection Date: 13-Oct-2018 14:05 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.91**		**0.300**	**1.00**	**1.00**	**mg/L**	10	17-Oct-2018 06:54

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
Sample ID: 16TB06-181015
Collection Date: 15-Oct-2018 08:45

ANALYTICAL REPORT
WorkOrder:HS18100823
Lab ID:HS18100823-08
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	23-Oct-2018 00:17
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 00:17
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 00:17
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 00:17
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	23-Oct-2018 00:17
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 00:17
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 00:17
Surr: 1,2-Dichloroethane-d4	*94.2*			**0**	*70-126*	*%REC*	*1*	*23-Oct-2018 00:17*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*81-113*	*%REC*	*1*	*23-Oct-2018 00:17*
Surr: Dibromofluoromethane	*97.0*			**0**	*77-123*	*%REC*	*1*	*23-Oct-2018 00:17*
Surr: Toluene-d8	*93.0*			**0**	*82-127*	*%REC*	*1*	*23-Oct-2018 00:17*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
Sample ID: 16WW29-181015
Collection Date: 15-Oct-2018 09:30

ANALYTICAL REPORT
WorkOrder:HS18100823
Lab ID:HS18100823-09
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	23-Oct-2018 02:20
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 02:20
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 02:20
cis-1,2-Dichloroethene	**8.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	23-Oct-2018 02:20
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	23-Oct-2018 02:20
Trichloroethene	**3.3**		**0.20**	**0.50**	**1.0**	**ug/L**	1	23-Oct-2018 02:20
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 02:20
Surr: 1,2-Dichloroethane-d4	*96.2*			**0**	*70-126*	*%REC*	*1*	*23-Oct-2018 02:20*
Surr: 4-Bromofluorobenzene	*99.6*			**0**	*81-113*	*%REC*	*1*	*23-Oct-2018 02:20*
Surr: Dibromofluoromethane	*97.8*			**0**	*77-123*	*%REC*	*1*	*23-Oct-2018 02:20*
Surr: Toluene-d8	*92.6*			**0**	*82-127*	*%REC*	*1*	*23-Oct-2018 02:20*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	0.00100	U	0.000144	0.00100	0.00100	mg/L	1	18-Oct-2018 18:15
Ethene	**0.00187**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 18:15
Methane	**0.00241**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	18-Oct-2018 18:15
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**45.9**		**5.00**	**5.00**	**5.00**	**mg/L**	1	18-Oct-2018 00:11
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**0.218**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 02:47
Chloride	**45.4**		**0.200**	**0.500**	**0.500**	**mg/L**	1	17-Oct-2018 02:47
Fluoride	**0.0530**	J	**0.0500**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 02:47
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	17-Oct-2018 02:47
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	17-Oct-2018 02:47
Sulfate	**99.2**		**2.00**	**5.00**	**5.00**	**mg/L**	10	17-Oct-2018 03:01
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	01-Nov-2018 11:28

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
Sample ID: 16WW55-181015
Collection Date: 15-Oct-2018 10:30

ANALYTICAL REPORT
WorkOrder:HS18100823
Lab ID:HS18100823-10
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	ug/L	10	23-Oct-2018 02:46
1,1-Dichloroethene	5.0	U	2.0	5.0	10	ug/L	10	23-Oct-2018 02:46
1,2-Dichloroethane	5.0	U	2.0	5.0	10	ug/L	10	23-Oct-2018 02:46
cis-1,2-Dichloroethene	**540**		**2.0**	**5.0**	**10**	**ug/L**	10	23-Oct-2018 02:46
Methylene chloride	10	U	10	10	20	ug/L	10	23-Oct-2018 02:46
Trichloroethene	**5,900**		**20**	**50**	**100**	**ug/L**	100	23-Oct-2018 03:13
Vinyl chloride	5.0	U	2.0	5.0	10	ug/L	10	23-Oct-2018 02:46
Surr: 1,2-Dichloroethane-d4	*92.7*			**0**	*70-126*	*%REC*	*10*	*23-Oct-2018 02:46*
Surr: 1,2-Dichloroethane-d4	*94.1*			**0**	*70-126*	*%REC*	*100*	*23-Oct-2018 03:13*
Surr: 4-Bromofluorobenzene	*100*			**0**	*81-113*	*%REC*	*10*	*23-Oct-2018 02:46*
Surr: 4-Bromofluorobenzene	*99.1*			**0**	*81-113*	*%REC*	*100*	*23-Oct-2018 03:13*
Surr: Dibromofluoromethane	*97.6*			**0**	*77-123*	*%REC*	*10*	*23-Oct-2018 02:46*
Surr: Dibromofluoromethane	*94.7*			**0**	*77-123*	*%REC*	*100*	*23-Oct-2018 03:13*
Surr: Toluene-d8	*91.8*			**0**	*82-127*	*%REC*	*10*	*23-Oct-2018 02:46*
Surr: Toluene-d8	*91.7*			**0**	*82-127*	*%REC*	*100*	*23-Oct-2018 03:13*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000749**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 18:24
Ethene	**0.00379**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	18-Oct-2018 18:24
Methane	**0.136**		**0.000535**	**0.00250**	**0.00250**	**mg/L**	5	18-Oct-2018 18:34
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**347**		**5.00**	**5.00**	**5.00**	**mg/L**	1	18-Oct-2018 00:17
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**2.12**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 03:16
Chloride	**1,000**		**20.0**	**50.0**	**50.0**	**mg/L**	100	17-Oct-2018 03:45
Fluoride	**0.152**		**0.0500**	**0.100**	**0.100**	**mg/L**	1	17-Oct-2018 03:16
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	17-Oct-2018 03:16
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	17-Oct-2018 03:16
Sulfate	**1,110**		**20.0**	**50.0**	**50.0**	**mg/L**	100	17-Oct-2018 03:45
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	29-Oct-2018 15:58
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0			1	01-Nov-2018 11:28

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325666 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18100823-01	16EW08-181013	13 Oct 2018 10:45			17 Oct 2018 04:00	10
HS18100823-02	16EW07-181013	13 Oct 2018 11:00			17 Oct 2018 04:14	10
HS18100823-03	16EW15-181013	13 Oct 2018 12:20			17 Oct 2018 05:56	10
HS18100823-04	16EW11-181013	13 Oct 2018 12:55			17 Oct 2018 06:11	10
HS18100823-05	16EW14B-181013	13 Oct 2018 13:20			17 Oct 2018 06:25	10
HS18100823-06	16EW12B-181013	13 Oct 2018 13:30			17 Oct 2018 06:40	10
HS18100823-07	16EW13-181013	13 Oct 2018 14:05			17 Oct 2018 06:54	10
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			17 Oct 2018 03:01	10
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			17 Oct 2018 02:47	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			17 Oct 2018 03:45	100
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			17 Oct 2018 03:16	1
Batch ID: R325707 (0)	**Test Name :** ALKALINITY BY SM2320B				**Matrix:** Groundwater	
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			18 Oct 2018 00:11	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			18 Oct 2018 00:17	1
Batch ID: R325736 (0)	**Test Name :** DISSOLVED GASES BY RSK-175				**Matrix:** Groundwater	
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			18 Oct 2018 18:15	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			18 Oct 2018 18:34	5
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			18 Oct 2018 18:24	1
Batch ID: R325941 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			23 Oct 2018 02:20	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			23 Oct 2018 03:13	100
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			23 Oct 2018 02:46	10
Batch ID: R325941 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Water	
HS18100823-08	16TB06-181015	15 Oct 2018 08:45			23 Oct 2018 00:17	1
Batch ID: R326322 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Groundwater	
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			29 Oct 2018 15:58	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			29 Oct 2018 15:58	1
Batch ID: R326589 (0)	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18100823-09	16WW29-181015	15 Oct 2018 09:30			01 Nov 2018 11:28	1
HS18100823-10	16WW55-181015	15 Oct 2018 10:30			01 Nov 2018 11:28	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325736 (0) **Instrument:** FID-4 **Method:** DISSOLVED GASES BY RSK-175

MBLK Sample ID: **MBLK-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 13:19**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784197** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.00100	0.00100								U
Ethene	0.00100	0.00100								U
Methane	0.000500	0.000500								U

LCS Sample ID: **LCS-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 12:58**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784195** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0167	0.00100	0.01804	0	92.5	75 - 125				
Ethene	0.0158	0.00100	0.0168	0	93.9	75 - 125				
Methane	0.00883	0.000500	0.009647	0	91.5	75 - 125				

LCSD Sample ID: **LCSD-181018** Units: **mg/L** Analysis Date: **18-Oct-2018 13:09**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784196** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0171	0.00100	0.01804	0	94.7	75 - 125	0.01668	2.36	30	
Ethene	0.0164	0.00100	0.0168	0	97.4	75 - 125	0.01577	3.66	30	
Methane	0.00805	0.000500	0.009647	0	83.4	75 - 125	0.008831	9.29	30	

MS Sample ID: **HS18100713-02MS** Units: **mg/L** Analysis Date: **18-Oct-2018 16:40**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784204** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0220	0.00100	0.01804	0.0004656	119	75 - 125				
Ethene	0.0255	0.00100	0.0168	0.002499	137	75 - 125				S
Methane	0.0294	0.000500	0.009647	0.01297	170	75 - 125				S

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: **R325736 (0)** **Instrument:** **FID-4** **Method:** **DISSOLVED GASES BY RSK-175**

MSD Sample ID: **HS18100713-02MSD** Units: **mg/L** Analysis Date: **18-Oct-2018 17:05**
Client ID: Run ID: **FID-4_325736** SeqNo: **4784205** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0213	0.00100	0.01804	0.0004656	116	75 - 125	0.02200	3.2	30	
Ethene	0.0238	0.00100	0.0168	0.002499	127	75 - 125	0.02546	6.57	30	S
Methane	0.0332	0.000500	0.009647	0.01297	210	75 - 125	0.02937	12.3	30	S

The following samples were analyzed in this batch: HS18100823-09 HS18100823-10

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** 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

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** 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	*46.3*	*1.0*	*50*	*0*	*92.6*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.52*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*49.27*	*1.0*	*50*	*0*	*98.5*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.76*	*1.0*	*50*	*0*	*93.5*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** 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	20.98	1.0	20	0	105	77 - 118				
1,1,1-Trichloroethane	19.64	1.0	20	0	98.2	70 - 130				
1,1,2,2-Tetrachloroethane	17.96	1.0	20	0	89.8	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.99	1.0	20	0	105	70 - 130				
1,1,2-Trichloroethane	20.41	1.0	20	0	102	77 - 113				
1,1-Dichloroethane	20.53	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.06	1.0	20	0	100	70 - 130				
1,1-Dichloropropene	22.5	1.0	20	0	112	78 - 118				
1,2,3-Trichlorobenzene	17.77	1.0	20	0	88.9	70 - 130				
1,2,3-Trichloropropane	17.7	1.0	20	0	88.5	70 - 127				
1,2,4-Trichlorobenzene	18.89	1.0	20	0	94.4	77 - 126				
1,2,4-Trimethylbenzene	21.53	1.0	20	0	108	73 - 121				
1,2-Dibromo-3-chloropropane	16.42	1.0	20	0	82.1	70 - 130				
1,2-Dibromoethane	20.99	1.0	20	0	105	76 - 123				
1,2-Dichlorobenzene	19.8	1.0	20	0	99.0	77 - 113				
1,2-Dichloroethane	22.4	1.0	20	0	112	70 - 124				
1,2-Dichloropropane	21.68	1.0	20	0	108	72 - 119				
1,3,5-Trimethylbenzene	19.63	1.0	20	0	98.1	75 - 118				
1,3-Dichlorobenzene	20.39	1.0	20	0	102	78 - 118				
1,3-Dichloropropane	20.76	1.0	20	0	104	75 - 116				
1,4-Dichlorobenzene	20.48	1.0	20	0	102	79 - 113				
2,2-Dichloropropane	21.26	1.0	20	0	106	70 - 130				
2-Butanone	37.26	2.0	40	0	93.1	70 - 130				
2-Chlorotoluene	21.74	1.0	20	0	109	70 - 128				
2-Hexanone	37.73	2.0	40	0	94.3	70 - 130				
4-Chlorotoluene	22.05	1.0	20	0	110	74 - 126				
4-Isopropyltoluene	18.57	1.0	20	0	92.9	74 - 126				
4-Methyl-2-pentanone	38.58	2.0	40	0	96.4	70 - 130				
Acetone	35.79	2.0	40	0	89.5	70 - 130				
Benzene	20.87	1.0	20	0	104	74 - 120				
Bromobenzene	20.17	1.0	20	0	101	78 - 113				
Bromochloromethane	21.03	1.0	20	0	105	76 - 124				
Bromodichloromethane	21.68	1.0	20	0	108	74 - 122				
Bromoform	20.1	1.0	20	0	100	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.27	1.0	20	0	121	70 - 130				
Carbon disulfide	39	2.0	40	0	97.5	70 - 130				
Carbon tetrachloride	21.91	1.0	20	0	110	71 - 125				
Chlorobenzene	21.19	1.0	20	0	106	76 - 113				
Chloroethane	20.22	1.0	20	0	101	70 - 130				
Chloroform	19.9	1.0	20	0	99.5	71 - 121				
Chloromethane	17.84	1.0	20	0	89.2	70 - 129				
cis-1,2-Dichloroethene	20.75	1.0	20	0	104	75 - 122				
cis-1,3-Dichloropropene	22.35	1.0	20	0	112	73 - 127				
Dibromochloromethane	20.66	1.0	20	0	103	77 - 122				
Dibromomethane	21.73	1.0	20	0	109	78 - 121				
Dichlorodifluoromethane	14.06	1.0	20	0	70.3	70 - 130				
Ethylbenzene	22.66	1.0	20	0	113	77 - 117				
Hexachlorobutadiene	19.74	1.0	20	0	98.7	70 - 130				
Isopropylbenzene	20.29	1.0	20	0	101	73 - 127				
m,p-Xylene	45.44	2.0	40	0	114	77 - 122				
Methylene chloride	20.98	2.0	20	0	105	70 - 127				
Naphthalene	15.92	1.0	20	0	79.6	70 - 130				
n-Butylbenzene	20.72	1.0	20	0	104	72 - 130				
n-Propylbenzene	22.1	1.0	20	0	111	73 - 124				
o-Xylene	22.51	1.0	20	0	113	75 - 119				
sec-Butylbenzene	19.08	1.0	20	0	95.4	73 - 128				
Styrene	21.44	1.0	20	0	107	72 - 126				
tert-Butylbenzene	21.37	1.0	20	0	107	73 - 124				
Tetrachloroethene	20.51	1.0	20	0	103	76 - 119				
Toluene	20.48	1.0	20	0	102	77 - 118				
trans-1,2-Dichloroethene	21.45	1.0	20	0	107	72 - 127				
trans-1,3-Dichloropropene	22.37	1.0	20	0	112	77 - 119				
Trichloroethene	20.69	1.0	20	0	103	77 - 121				
Trichlorofluoromethane	20.23	1.0	20	0	101	70 - 130				
Vinyl chloride	19.59	1.0	20	0	98.0	70 - 130				
Surr: 1,2-Dichloroethane-d4	*48.23*	*1.0*	*50*	*0*	*96.5*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.84*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.26*	*1.0*	*50*	*0*	*94.5*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.21*	*1.0*	*50*	*0*	*90.4*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** 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	19.41	1.0	20	0	97.0	70 - 120				
1,1,1-Trichloroethane	19.4	1.0	20	0	97.0	70 - 130				
1,1,2,2-Tetrachloroethane	17.37	1.0	20	0	86.9	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.03	1.0	20	0	110	70 - 130				
1,1,2-Trichloroethane	19.17	1.0	20	0	95.9	70 - 117				
1,1-Dichloroethane	19.29	1.0	20	0	96.5	70 - 127				
1,1-Dichloroethene	19.68	1.0	20	0	98.4	70 - 130				
1,1-Dichloropropene	21.95	1.0	20	0	110	70 - 129				
1,2,3-Trichlorobenzene	16.44	1.0	20	0	82.2	70 - 130				
1,2,3-Trichloropropane	17.16	1.0	20	0	85.8	70 - 130				
1,2,4-Trichlorobenzene	17.6	1.0	20	0	88.0	70 - 125				
1,2,4-Trimethylbenzene	61.55	1.0	20	43.59	89.8	70 - 125				
1,2-Dibromo-3-chloropropane	16.6	1.0	20	0	83.0	70 - 130				
1,2-Dibromoethane	19.67	1.0	20	0	98.3	70 - 124				
1,2-Dichlorobenzene	18.3	1.0	20	0	91.5	70 - 115				
1,2-Dichloroethane	20.17	1.0	20	0	101	70 - 127				
1,2-Dichloropropane	20.54	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	30.62	1.0	20	12.44	90.9	70 - 126				
1,3-Dichlorobenzene	18.83	1.0	20	0	94.1	70 - 119				
1,3-Dichloropropane	19.02	1.0	20	0	95.1	70 - 121				
1,4-Dichlorobenzene	18.72	1.0	20	0	93.6	70 - 114				
2,2-Dichloropropane	20.55	1.0	20	0	103	70 - 130				
2-Butanone	38.86	2.0	40	0	97.1	70 - 130				
2-Chlorotoluene	23.52	1.0	20	0	118	70 - 130				
2-Hexanone	38.24	2.0	40	0	95.6	70 - 130				
4-Chlorotoluene	21.57	1.0	20	0	108	70 - 130				
4-Isopropyltoluene	18.47	1.0	20	0	92.3	70 - 130				
4-Methyl-2-pentanone	38.16	2.0	40	0	95.4	70 - 130				
Acetone	38.75	2.0	40	0	96.9	70 - 130				
Benzene	181	1.0	20	166.5	72.4	70 - 127				O
Bromobenzene	18.48	1.0	20	0	92.4	70 - 115				
Bromochloromethane	20.63	1.0	20	0	103	70 - 127				
Bromodichloromethane	20.54	1.0	20	0	103	70 - 124				
Bromoform	18.6	1.0	20	0	93.0	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.17	1.0	20	0	101	70 - 130				
Carbon disulfide	40.08	2.0	40	0	100	70 - 130				
Carbon tetrachloride	22.3	1.0	20	0	111	70 - 130				
Chlorobenzene	19.87	1.0	20	0	99.4	70 - 114				
Chloroethane	19.12	1.0	20	0	95.6	70 - 130				
Chloroform	19.62	1.0	20	0	98.1	70 - 125				
Chloromethane	15.44	1.0	20	0	77.2	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	20.64	1.0	20	0	103	70 - 125				
Dibromochloromethane	19.47	1.0	20	0	97.3	70 - 124				
Dibromomethane	20.21	1.0	20	0	101	70 - 124				
Dichlorodifluoromethane	14.4	1.0	20	0	72.0	70 - 130				
Ethylbenzene	75.37	1.0	20	55.91	97.3	70 - 124				
Hexachlorobutadiene	17.18	1.0	20	0	85.9	70 - 130				
Isopropylbenzene	25.53	1.0	20	6.06	97.3	70 - 130				
m,p-Xylene	248.5	2.0	40	210.2	95.9	70 - 130				O
Methylene chloride	18.9	2.0	20	0	94.5	70 - 128				
Naphthalene	26.9	1.0	20	5.256	108	70 - 130				
n-Butylbenzene	20.25	1.0	20	0	101	70 - 130				
n-Propylbenzene	26.25	1.0	20	2.169	120	70 - 130				
o-Xylene	123.6	1.0	20	102.9	104	70 - 124				O
sec-Butylbenzene	18.85	1.0	20	0.6856	90.8	70 - 130				
Styrene	21.79	1.0	20	0	109	70 - 130				
tert-Butylbenzene	20.62	1.0	20	0	103	70 - 130				
Tetrachloroethene	19.94	1.0	20	0	99.7	70 - 130				
Toluene	21.22	1.0	20	1.768	97.3	70 - 123				
trans-1,2-Dichloroethene	20.6	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	20.59	1.0	20	0	103	70 - 121				
Trichloroethene	26.83	1.0	20	0	134	70 - 129				S
Trichlorofluoromethane	20.86	1.0	20	0	104	70 - 130				
Vinyl chloride	19.93	1.0	20	0	99.7	70 - 130				
Surr: 1,2-Dichloroethane-d4	*50.27*	*1.0*	*50*	*0*	*101*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.87*	*1.0*	*50*	*0*	*102*	*81 - 113*				
Surr: Dibromofluoromethane	*47.55*	*1.0*	*50*	*0*	*95.1*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.73*	*1.0*	*50*	*0*	*89.5*	*82 - 127*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** 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	19.51	1.0	20	0	97.6	70 - 120	19.41	0.545	20	
1,1,1-Trichloroethane	18.79	1.0	20	0	94.0	70 - 130	19.4	3.19	20	
1,1,2,2-Tetrachloroethane	17.04	1.0	20	0	85.2	70 - 123	17.37	1.92	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	21.24	1.0	20	0	106	70 - 130	22.03	3.67	20	
1,1,2-Trichloroethane	19.25	1.0	20	0	96.2	70 - 117	19.17	0.375	20	
1,1-Dichloroethane	19.05	1.0	20	0	95.3	70 - 127	19.29	1.27	20	
1,1-Dichloroethene	18.7	1.0	20	0	93.5	70 - 130	19.68	5.12	20	
1,1-Dichloropropene	21.31	1.0	20	0	107	70 - 129	21.95	2.97	20	
1,2,3-Trichlorobenzene	17.51	1.0	20	0	87.6	70 - 130	16.44	6.3	20	
1,2,3-Trichloropropane	16.89	1.0	20	0	84.4	70 - 130	17.16	1.61	20	
1,2,4-Trichlorobenzene	18.72	1.0	20	0	93.6	70 - 125	17.6	6.18	20	
1,2,4-Trimethylbenzene	61.24	1.0	20	43.59	88.2	70 - 125	61.55	0.505	20	
1,2-Dibromo-3-chloropropane	15.91	1.0	20	0	79.5	70 - 130	16.6	4.27	20	
1,2-Dibromoethane	20.02	1.0	20	0	100	70 - 124	19.67	1.78	20	
1,2-Dichlorobenzene	18.41	1.0	20	0	92.1	70 - 115	18.3	0.633	20	
1,2-Dichloroethane	20	1.0	20	0	100.0	70 - 127	20.17	0.868	20	
1,2-Dichloropropane	0.5000	1.0	20	0	0	70 - 122	20.54	0	20	SU
1,3,5-Trimethylbenzene	29.85	1.0	20	12.44	87.1	70 - 126	30.62	2.53	20	
1,3-Dichlorobenzene	18.95	1.0	20	0	94.7	70 - 119	18.83	0.622	20	
1,3-Dichloropropane	19.72	1.0	20	0	98.6	70 - 121	19.02	3.59	20	
1,4-Dichlorobenzene	18.92	1.0	20	0	94.6	70 - 114	18.72	1.02	20	
2,2-Dichloropropane	19.62	1.0	20	0	98.1	70 - 130	20.55	4.62	20	
2-Butanone	38.43	2.0	40	0	96.1	70 - 130	38.86	1.1	20	
2-Chlorotoluene	23.1	1.0	20	0	116	70 - 130	23.52	1.78	20	
2-Hexanone	38.81	2.0	40	0	97.0	70 - 130	38.24	1.49	20	
4-Chlorotoluene	21.41	1.0	20	0	107	70 - 130	21.57	0.73	20	
4-Isopropyltoluene	18.2	1.0	20	0	91.0	70 - 130	18.47	1.48	20	
4-Methyl-2-pentanone	37.86	2.0	40	0	94.6	70 - 130	38.16	0.788	20	
Acetone	37.12	2.0	40	0	92.8	70 - 130	38.75	4.29	20	
Benzene	176.2	1.0	20	166.5	48.2	70 - 127	181	2.7	20	SO
Bromobenzene	18.46	1.0	20	0	92.3	70 - 115	18.48	0.0757	20	
Bromochloromethane	20.08	1.0	20	0	100	70 - 127	20.63	2.68	20	
Bromodichloromethane	20.57	1.0	20	0	103	70 - 124	20.54	0.16	20	
Bromoform	18.81	1.0	20	0	94.1	70 - 129	18.6	1.15	20	

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.56	1.0	20	0	103	70 - 130	20.17	1.91	20	
Carbon disulfide	37.77	2.0	40	0	94.4	70 - 130	40.08	5.93	20	
Carbon tetrachloride	20.71	1.0	20	0	104	70 - 130	22.3	7.36	20	
Chlorobenzene	20.38	1.0	20	0	102	70 - 114	19.87	2.51	20	
Chloroethane	20.74	1.0	20	0	104	70 - 130	19.12	8.11	20	
Chloroform	18.96	1.0	20	0	94.8	70 - 125	19.62	3.4	20	
Chloromethane	15.67	1.0	20	0	78.3	70 - 130	15.44	1.47	20	
cis-1,2-Dichloroethene	19.73	1.0	20	0	98.6	70 - 128	20.24	2.57	20	
cis-1,3-Dichloropropene	20.93	1.0	20	0	105	70 - 125	20.64	1.37	20	
Dibromochloromethane	19.42	1.0	20	0	97.1	70 - 124	19.47	0.244	20	
Dibromomethane	20.66	1.0	20	0	103	70 - 124	20.21	2.2	20	
Dichlorodifluoromethane	14.09	1.0	20	0	70.4	70 - 130	14.4	2.23	20	
Ethylbenzene	75.65	1.0	20	55.91	98.7	70 - 124	75.37	0.358	20	
Hexachlorobutadiene	16.59	1.0	20	0	83.0	70 - 130	17.18	3.49	20	
Isopropylbenzene	25.15	1.0	20	6.06	95.5	70 - 130	25.53	1.48	20	
m,p-Xylene	249	2.0	40	210.2	97.1	70 - 130	248.5	0.187	20	O
Methylene chloride	18.53	2.0	20	0	92.7	70 - 128	18.9	1.96	20	
Naphthalene	28.74	1.0	20	5.256	117	70 - 130	26.9	6.61	20	
n-Butylbenzene	19.84	1.0	20	0	99.2	70 - 130	20.25	2	20	
n-Propylbenzene	25.31	1.0	20	2.169	116	70 - 130	26.25	3.62	20	
o-Xylene	123.5	1.0	20	102.9	103	70 - 124	123.6	0.113	20	O
sec-Butylbenzene	18.22	1.0	20	0.6856	87.7	70 - 130	18.85	3.44	20	
Styrene	22.52	1.0	20	0	113	70 - 130	21.79	3.29	20	
tert-Butylbenzene	20.03	1.0	20	0	100	70 - 130	20.62	2.92	20	
Tetrachloroethene	19.39	1.0	20	0	96.9	70 - 130	19.94	2.83	20	
Toluene	21.02	1.0	20	1.768	96.3	70 - 123	21.22	0.942	20	
trans-1,2-Dichloroethene	19.86	1.0	20	0	99.3	70 - 130	20.6	3.63	20	
trans-1,3-Dichloropropene	21.55	1.0	20	0	108	70 - 121	20.59	4.54	20	
Trichloroethene	22.9	1.0	20	0	115	70 - 129	26.83	15.8	20	
Trichlorofluoromethane	19.67	1.0	20	0	98.3	70 - 130	20.86	5.91	20	
Vinyl chloride	18.77	1.0	20	0	93.9	70 - 130	19.93	5.98	20	
Surr: 1,2-Dichloroethane-d4	*47.89*	*1.0*	*50*	*0*	*95.8*	*70 - 126*	*50.27*	*4.85*	*20*	
Surr: 4-Bromofluorobenzene	*52.06*	*1.0*	*50*	*0*	*104*	*81 - 113*	*50.87*	*2.32*	*20*	
Surr: Dibromofluoromethane	*47.8*	*1.0*	*50*	*0*	*95.6*	*77 - 123*	*47.55*	*0.523*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.94*	*1.0*	*50*	*0*	*89.9*	*82 - 127*	*44.73*	*0.476*	*20*	

The following samples were analyzed in this batch: HS18100823-08 HS18100823-09 HS18100823-10

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325666 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:03**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777661** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U
Chloride	0.500	0.500								U
Fluoride	0.100	0.100								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

LCS Sample ID: **WLCSW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:18**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777662** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.648	0.100	4	0	91.2	80 - 120				
Chloride	20.21	0.500	20	0	101	80 - 120				
Fluoride	4.345	0.100	4	0	109	80 - 120				
Nitrogen, Nitrate (As N)	3.932	0.100	4	0	98.3	80 - 120				
Nitrogen, Nitrite (As N)	4.194	0.100	4	0	105	80 - 120				
Sulfate	20.01	0.500	20	0	100	80 - 120				

LCSD Sample ID: **WLCSDW2-101618** Units: **mg/L** Analysis Date: **17-Oct-2018 02:32**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777663** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.65	0.100	4	0	91.2	80 - 120	3.648	0.0548	20	
Chloride	20.16	0.500	20	0	101	80 - 120	20.21	0.268	20	
Fluoride	4.338	0.100	4	0	108	80 - 120	4.345	0.161	20	
Nitrogen, Nitrate (As N)	3.912	0.100	4	0	97.8	80 - 120	3.932	0.51	20	
Nitrogen, Nitrite (As N)	4.185	0.100	4	0	105	80 - 120	4.194	0.215	20	
Sulfate	20	0.500	20	0	100	80 - 120	20.01	0.03	20	

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325666 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MS Sample ID: **HS18100727-05MS** Units: **mg/L** Analysis Date: **17-Oct-2018 08:22**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777687** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.55	1.00	20	5.566	89.9	80 - 120				
Chloride	1480	5.00	100	1372	108	80 - 120				EO
Fluoride	21.04	1.00	20	0.258	104	80 - 120				
Nitrogen, Nitrate (As N)	20.58	1.00	20	0	103	80 - 120				
Nitrogen, Nitrite (As N)	21.98	1.00	20	0	110	80 - 120				
Sulfate	1577	5.00	100	1474	103	80 - 120				EO

MSD Sample ID: **HS18100727-05MSD** Units: **mg/L** Analysis Date: **17-Oct-2018 08:36**
Client ID: Run ID: **ICS2100_325666** SeqNo: **4777688** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	23.94	1.00	20	5.566	91.8	80 - 120	23.55	1.62	20	
Chloride	1503	5.00	100	1372	131	80 - 120	1480	1.52	20	SEO
Fluoride	21.43	1.00	20	0.258	106	80 - 120	21.04	1.82	20	
Nitrogen, Nitrate (As N)	20.74	1.00	20	0	104	80 - 120	20.58	0.77	20	
Nitrogen, Nitrite (As N)	22.33	1.00	20	0	112	80 - 120	21.98	1.58	20	
Sulfate	1602	5.00	100	1474	129	80 - 120	1577	1.59	20	SEO

The following samples were analyzed in this batch:

HS18100823-01	HS18100823-02	HS18100823-03	HS18100823-04
HS18100823-05	HS18100823-06	HS18100823-07	HS18100823-09
HS18100823-10			

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: HS18100823

QC BATCH REPORT

Batch ID: R325707 (0) **Instrument:** ManTech01 **Method:** ALKALINITY BY SM2320B

MBLK Sample ID: **WBLKW1-181018** Units: **mg/L** Analysis Date: **17-Oct-2018 22:11**
Client ID: Run ID: **ManTech01_325707** SeqNo: **4778804** 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

LCS Sample ID: **WLCS1-181018** Units: **mg/L** Analysis Date: **17-Oct-2018 22:20**
Client ID: Run ID: **ManTech01_325707** SeqNo: **4778805** 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				

LCSD Sample ID: **WLCSD1-181018** Units: **mg/L** Analysis Date: **17-Oct-2018 22:29**
Client ID: Run ID: **ManTech01_325707** SeqNo: **4778806** 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	1077	0.026	20	

DUP Sample ID: **HS18100849-01DUP** Units: **mg/L** Analysis Date: **18-Oct-2018 00:05**
Client ID: Run ID: **ManTech01_325707** SeqNo: **4778820** 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)	162.6	5.00					162.3	0.234	20	

The following samples were analyzed in this batch: HS18100823-09 HS18100823-10

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP-16
WorkOrder: **HS18100823**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/L	Milligrams per Liter

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18100823

Date/Time Received: **16-Oct-2018 09:15**
Received by: **NDR**

Checklist completed by: *Jared R. Makan* 16-Oct-2018
eSignature | Date

Reviewed by:
eSignature | Date

Matrices: **Water**

Carrier name: **FedEx Priority Overnight**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:N/A
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☐	☑	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	0.6c/0.3c UC/C	IR25
Cooler(s)/Kit(s):	44118	
Date/Time sample(s) sent to storage:	10/16/2018 10:30	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes: 16WW29 collection time differs: COC = 09:30, Sample containers = 10:05. Logged in per COC.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181015 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	FedInvoices@aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-16			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060		
16EW08-181013	16EW08	9.3	9.61	FT	GW	10/13/2018	1045	1					1				
16EW07-181013	16EW07	14.36	14.67	FT	GW	10/13/2018	1100	1					1				
16EW15-181013	16EW15	17.84	18.97	FT	GW	10/13/2018	1220	1					1				
16EW11-181013	16EW11	20.76	21.35	FT	GW	10/13/2018	1255	1					1				
16EW14B-181013	16EW14B	16.73	16.94	FT	GW	10/13/2018	1320	1					1				
16EW12B-181013	16EW12B	17.46	17.9	FT	GW	10/13/2018	1330	1					1				
16EW13-181013	16EW13	17.4	17.93	FT	GW	10/13/2018	1405	1					1				
16TB06-181015	FIELD QC				LIQ	10/15/2018	845	2		2							
16WW29-181015	16WW29	8.73	8.83	FT	GW	10/15/2018	930	11		3	1	1	1	3	2		
16WW55-181015	16WW55	22.88	23.01	FT	GW	10/15/2018	1030	11		3	1	1	1	3	2		

Aptim Environmental & Infrastucture, Inc.
LHAAP-16

HS18100823

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible] APTIM	10/14/1303	NK ALS	10/16/18 09:15

44118 Temp air 0.6
ice x 25 [illegible]

FedEx
TRK# 4380 9533 1399
TUE - 16 OCT 10:30A
PRIORITY OVERNIGHT
77099
TX-US
IAH
AB SGRA

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

CUSTODY SEAL
DATE: 10-15-18
Signature:
LHAAP
Jm 10/16/18

CUSTODY SEAL
DATE: 10-15-18
Signature:
LHAAP
Jm 10/16/18

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77099
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October 31, 2018

Analytical Report for Service Request No: K1810155

RJ Modashia
ALS Laboratory Group
10450 Stancliff Road
Suite 210
Houston, TX 77099-4338

RE: ALS Houston DOD TOC

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 17, 2018
For your reference, these analyses have been assigned our service request number **K1810155.**

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. 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.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

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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.

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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.

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	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 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/anlayte is offered by that state.

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Case Narrative

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ALS Environmental

Client: ALS Environmental - US
Project: ALS Houston DOD TOC
Sample Matrix: Ground Water

Service Request: K1810155
Date Received: 10/17/2018

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:

Two ground water samples were received for analysis at ALS Environmental on 10/17/2018. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry:

Method SM 5310 C, 10/30/2018:The Relative Percent Difference (RPD) criterion for the replicate analysis of Total Organic Carbon in sample 16WW29-181015 was not applicable because the analyte concentration was not significantly greater than the Method Reporting Limit (MRL). Analytical values derived from measurements close to the detection limit are not subject to the same accuracy and precision criteria as results derived from measurements higher on the calibration range for the method.

Approved by Kelley Lovejoy

Date 10/31/2018

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Chain of Custody

ALS Environmental—Kelso Laboratory
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K1810155

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Subcontract Chain of Custody

COC ID: 10025

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:	HS18100823
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100823-09**	**16WW29-181015**	**Groundwater**	**15 Oct 2018 09:30**
	TOC Analysis with DOD Level IV			30 Oct 2018
2.	**HS18100823-10**	**16WW55-181015**	**Groundwater**	**15 Oct 2018 10:30**
	TOC Analysis with DOD Level IV			30 Oct 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:	Pablo Marinez	Date/Time:	10-16-18 18:00
Received By:	Dana Rudow	Date/Time:	10-17-18 0950
Cooler ID(s):		Temperature(s):	

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01029615

PC KL

Cooler Receipt and Preservation Form

Client ALS - Houston Service Request K18 10155

Received: 10-17-18 Opened: 10-17-18 By: ASP Unloaded: 10-17-18 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 NA	Tracking Number NA	Filed
0.0	-0.2	1.7	1.5	-0.2	371	10075	4380 9533 6265	

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)636-1068
www.alsglobal.com

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1810155
Project:	ALS Houston DOD TOC	**Date Collected:**	10/15/18
Sample Matrix:	Ground Water	**Date Received:**	10/17/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
16WW29-181015	K1810155-001	**1.80**	0.50	0.20	0.07	1	10/30/18 15:36	
16WW55-181015	K1810155-002	**7.32**	0.50	0.20	0.07	1	10/30/18 16:57	
Method Blank	K1810155-MB	ND U	0.50	0.20	0.07	1	10/30/18 11:21	

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810155
Project	ALS Houston DOD TOC	**Date Collected:**	10/15/18
Sample Matrix:	Ground Water	**Date Received:**	10/17/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**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
16WW29-181015	K1810155-001DUP	0.50	0.20	0.07	1.80	1.51	1.66	17 *	10	10/30/18
16WW55-181015	K1810155-002DUP	0.50	0.20	0.07	7.32	6.82	7.07	7	10	10/30/18

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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810155
Project:	ALS Houston DOD TOC	**Date Collected:**	10/15/18
Sample Matrix:	Ground Water	**Date Received:**	10/17/18
		Date Analyzed:	10/30/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	16WW29-181015	**Units:**	mg/L
Lab Code:	K1810155-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1810155-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	1.80	28.3	25.0	106	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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810155
Project:	ALS Houston DOD TOC	**Date Analyzed:**	10/30/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	613206

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810155-LCS	19.8	21.9	91	83-117

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1810155
Project: ALS Houston DOD TOC

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	613206	KQ1815864-36	10/30/18 04:57	25.0	25.2	101	90-110
CCV2	613206	KQ1815864-37	10/30/18 10:48	25.0	24.7	99	90-110
CCV3	613206	KQ1815864-38	10/30/18 16:24	25.0	24.4	98	90-110
CCV4	613206	KQ1815864-39	10/30/18 22:45	25.0	24.8	99	90-110
CCV5	613206	KQ1815864-40	10/31/18 03:19	25.0	24.9	99	90-110
CCV6	613206	KQ1815864-41	10/31/18 09:08	25.0	24.6	98	90-110

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: ALS Houston DOD TOC

Service Request:K1810155

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C

Units:mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	613206	KQ1815864-42	10/30/18 05:14	0.50	0.20	0.07	ND	U
CCB2	613206	KQ1815864-43	10/30/18 11:04	0.50	0.20	0.07	ND	U
CCB3	613206	KQ1815864-44	10/30/18 16:40	0.50	0.20	0.07	ND	U
CCB4	613206	KQ1815864-45	10/30/18 23:01	0.50	0.20	0.07	ND	U
CCB5	613206	KQ1815864-46	10/31/18 03:35	0.50	0.20	0.07	ND	U
CCB6	613206	KQ1815864-47	10/31/18 09:25	0.50	0.20	0.07	ND	U

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1828987; 1828988; 1828989; 1829115

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2159 (225647)

General Set Information: There were eighteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly.

Method QC data: The method blank (LMB 624449) was less than 1/2 the CRDL. The recovery for the LCS (624450) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected. The relative percent differences (RPD's) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 25, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: October 29, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1829115**

Project ID: HS18100823

Purchase Order: HS18100823

Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW29-181015	1829115001	10/15/18	10/17/18	
16WW55-181015	1829115002	10/15/18	10/17/18	

ANALYTICAL REPORT

Workorder: 34-1829115
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID:	16WW29-181015	Sampling Site:	NA	Collected:	10/15/2018
Lab ID:	1829115001	Media:	125 mL Nalgene	Received:	10/17/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable	**Analysis:** EPA 6850, DoD QSM Water	**Instrument ID:** LCMS04	
	Batch: ELMS/2159 (HBN: 225647)	**Percent Solid:** NA	
	Analyzed: 10/24/2018 14:37	**Report Basis:** Wet	

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID:	16WW55-181015	Sampling Site:	NA	Collected:	10/15/2018
Lab ID:	1829115002	Media:	125 mL Nalgene	Received:	10/17/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable	**Analysis:** EPA 6850, DoD QSM Water	**Instrument ID:** LCMS04	
	Batch: ELMS/2159 (HBN: 225647)	**Percent Solid:** NA	
	Analyzed: 10/24/2018 14:51	**Report Basis:** Wet	

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**400**	10	20	40	10	

Comments

Workorder: 1829115

Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly.

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/25/2018 14:54	/S/ Stephen Brose 10/29/2018 08:45

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1829115
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1829115

Limits: Client SOW/Contract Specified
Basis: DoD QSM
Preparation: NA
Batch: NA
Prepared By: NA
Analysis: EPA 6850, DoD QSM
Batch: ELMS/2159 (HBN: 225647)
Analyzed By: Thomas Bosch

Blank

LMB: 624449
Analyzed: 10/24/2018 08:55
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 624450
Analyzed: 10/24/2018 09:09
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.90	5.00	97.9	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample: 1828988001		MS: 1828988002					MSD: 1828988003				
Analyzed: 10/24/2018 09:40		Analyzed: 10/24/2018 09:54					Analyzed: 10/24/2018 10:08				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	4.75	5	94.9	78.8	123.8	4.67	93.3	1.7	0.0	20.0

Sample: 1828989004		MS: 1828989005					MSD: 1828989006				
Analyzed: 10/24/2018 11:47		Analyzed: 10/24/2018 12:29					Analyzed: 10/24/2018 12:43				
Dilution: 1		Dilution: 1					Dilution: 1				
Units: ug/L		Units: ug/L					Units: ug/L				
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	5.4	5	108	78.8	123.8	6.26	# 125	14.7	0.0	20.0

Continuing Calibration Verification

CCV: 624446				CCV: 624451			CCV: 624453		
Analyzed: 10/24/2018 08:12				Analyzed: 10/24/2018 12:01			Analyzed: 10/24/2018 15:06		
Units: ug/L				Units: ug/L			Units: ug/L		
Criteria: ± 15%				Criteria: ± 15%			Criteria: ± 15%		
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	24.4	25.0	97.6	23.5	25.0	94.0	23.5	25.0	94.2

Interference Check Sample

ICSA: 624448
Analyzed: 10/24/2018 08:41
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	0.985	1.00	98.5

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Quality Control Sample
Batch Report

Analysis Information

Workorder: 1829115

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2159 (HBN: 225647)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Limit of Detection Verification

LODV:	624447			**LODV:**	624452		**LODV:**	624454	
Analyzed:	10/24/2018 08:27			**Analyzed:**	10/24/2018 12:15		**Analyzed:**	10/24/2018 15:20	
Units:	ug/L			**Units:**	ug/L		**Units:**	ug/L	
Criteria:	± 50%			**Criteria:**	± 50%		**Criteria:**	± 50%	
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	1.03	1.00	103	0.970	1.00	97.0	1.02	1.00	102

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/25/2018 14:54	10/29/2018 08:45

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

W 1829115

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Houston, TX 77099
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Subcontract Chain of Custody

COC ID: 10026

1829115

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	HS18100823
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18100823-09**	**16WW29-181015**	**Groundwater**	**15 Oct 2018 09:30**
	SUB_Perch-6850			30 Oct 2018
2.	**HS18100823-10**	**16WW55-181015**	**Groundwater**	**15 Oct 2018 10:30**
	SUB_Perch-6850			30 Oct 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:	Pablo Marinez	Date/Time:	10-16-18 18:00
Received By:	[illegible]	Date/Time:	10/17/18 905
Cooler ID(s):	8835	Temperature(s):	3°

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18100823	***Split:***	**Workorder ID:** 1829115	**Level:** ENV_LVL4
Client: ALS Environmental (Houston)		**Account:** 8101	**Type:** 125Poly
Comments:			**Preservatives**

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
1	10/15/2018 09:30	16WW29-181015	1829115001		Water	A	1	A
2	10/15/2018 10:30	16WW55-181015	1829115002		Water	A	1	A
3								
4								
5								
6								
7								
8								
9								
10								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/17/2018 09:05	ALS Sample Receiving	Sample Login
Julie Warath	10/17/18 1310	3C	storage
R.33.1	10/23/18 14:10	T. Bosch	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: 1829115

Date/Time of Receipt: 10/17/18 905

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8835	3 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Meredith Edens (Signature) Meredith E. Edens (Printed Name) 10/17/18 (Date)

CLIENT-RELATED INFORMATION

☐ Missing Cooler	☐ Missing Samples/Bottles	☐ Incorrect Preservation	☐ Insufficient Sample Volume
☐ Cooler Conditions	☐ Broken/Leaking Samples	☐ pH Criteria Not Met	☐ Chain of Custody Problems
☐ Missing Paperwork	☐ Incorrect Bottle Type	☐ Residual Chlorine Present	☐ Other:
☐ Missing/Incorrect Bottle Labels	☐ Cooler Temperatures Out of Range	☐ Head Space in Bottles	

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 16OCT18
ACTWGT: 20.65 LB
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

BILL THIRD PARTY

TO PAUL POPE
ALS LABORATORY GROUP
960 WEST LEVOY DRIVE

SALT LAKE CITY UT 84123

(800) 366-9136
REF: HS18100823 RM

FedEx Express

WED - 17 OCT 3:00P
STANDARD OVERNIGHT

TRK# 0201 4380 9533 6313

84123
UT-US SLC

AX BTFA

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Batch Worklist

Batch: ELMS/ 2159 **Created:** 10/23/2018 18:03 **Instrument:** **HBN:** 225647

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1828987 [ENV_LVL4]
Workorder: 1828988 [ENV_LVL4]
Workorder: 1828989 [ENV_LVL4]
Workorder: 1829115 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	624446	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
2	624447	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
3	624448	ICS for HBN 225647 [ELMS/2159]				ICS	3		E6850..D3Q	5311		10/29/2018	
4	624449	LMB for HBN 225647 [ELMS/2159]				LMB	3		E6850Q413Q	5311		10/29/2018	
5	624450	LCS for HBN 225647 [ELMS/2159]				LCS	3		E6850Q413Q	5311		10/29/2018	
6	1828987001	16WW32-181011				SAMPLE	3	1828987001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
7	1828988001	16SW01-181011				SAMPLE	3	1828988001-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
8	1828988002	16SW01-181011MS				MS	3	1828988002-A	E6850Q413Q	5480		10/29/2018	
9	1828988003	16SW01-181011MSD				MSD	3	1828988003-A	E6850Q413Q	5480		10/29/2018	
10	1828988004	16SW01-181011-FD				FLDDUP	3	1828988004-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
11	1828988005	16SW02-181011				SAMPLE	3	1828988005-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
12	1828988006	16SW03-181011				SAMPLE	3	1828988006-A	E6850Q41.3	5480	11/8/2018	10/29/2018	
13	1828989001	16WW30-181012				SAMPLE	3	1828989001-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
14	1828989002	16WW46-181012				SAMPLE	3	1828989002-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
15	1828989003	16WW23-181012				SAMPLE	3	1828989003-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
16	1828989004	16WW40-181012				SAMPLE	3	1828989004-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
17	624451	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
18	624452	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	
19	1828989005	16WW40-181012MS				MS	3	1828989005-A	E6850Q413Q	5480		10/29/2018	
20	1828989006	16WW40-181012MSD				MSD	3	1828989006-A	E6850Q413Q	5480		10/29/2018	
21	1828989007	16WW40-181012-FD				FLDDUP	3	1828989007-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
22	1828989008	16WW27-181012				SAMPLE	3	1828989008-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
23	1828989009	16WW12-181012				SAMPLE	3	1828989009-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
24	1828989010	16WW42-181012				SAMPLE	3	1828989010-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
25	1828989011	16WW13-181012				SAMPLE	3	1828989011-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
26	1828989012	16WW21-181012				SAMPLE	3	1828989012-A	E6850Q41.3	5480	11/9/2018	10/29/2018	

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Batch Worklist

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
27	1828989013	16EB01-181012				EQBK	3	1828989013-A	E6850Q41.3	5480	11/9/2018	10/29/2018	
28	1829115001	16WW29-181015				SAMPLE	3	1829115001-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
29	1829115002	16WW55-181015				SAMPLE	3	1829115002-A	E6850Q41.3	5480	11/12/2018	10/30/2018	
30	624453	CCV for HBN 225647 [ELMS/2159]				CCV	3		E685041C3Q	5311		10/29/2018	
31	624454	LODV for HBN 225647 [ELMS/2159				LODV	3		E6850..D3Q	5311		10/29/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1828987 (001); 1828988 (001-06); 1828989 (001-13); 1829115 (001,02)
ELMS Batch/HBN ID: 2159 (225647)
Prep Date: 10/23/2018 Analysis Date: 10/24/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\24OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 624450; Target = 5.0µg/L. ASTM type II water was used for LMB 624449.

MS/MSD: MS/MSD was performed on samples 1828988002/03 and 1828989005/06 (Client ID's: 16WW32-181011/16WW40-181012). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:

1) Results reported in µg/L. Field sample 1829115002 was analyzed and reported from a 1:10 dilution. The reporting limit has been adjusted accordingly. Samples 1828989004/07 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters, except for the following. The Matrix Spike duplicate (MSD - 1828989006) failed QC acceptance criteria for percent recovery, biased high. The Matrix Spike and Matrix Spike duplicate is reported for the clients' information only. The sample matrix may be inappropriate for the method selected.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225647-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS 2159 HBN 225647 **Sample Set IDs if Applicable:** 18-28987/18289881/18289889/1829115	**Analyst Initials**	**Reviewer Initials**
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

T.B. 10.26.18
SB 10/29/18

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ALS

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK	Description - 6850 Stock AccStd 1,000ug/mL

Standard:	43659	**Created By:**	Thomas Bosch	**Amount:**	100 mL
MFG:	AccuStandard	**Create Date:**	09/17/2018 09:09AM	**Expires:**	07/25/2020
MFG Lot:	218065075			**Usable:**	No
Part ID:	IC-PER-10X-1			**Lab Lot:**	CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		**Description - ASTM Type II Water**
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025
MFG Lot: Not Provided		**Usable:** Yes
Part ID: Not Provided		**Lab Lot:** LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description - 6850 QC Stock STD 1,000ug/mL**

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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ALS

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK	Description - Perchlorate ISTD Wrk 1,000ug/L

Standard:	**43730**	**Created By:**	Thomas Bosch	**Amount:**	25 mL
MFG:	ALS/SLC	**Create Date:**	09/20/2018 09:09AM	**Expires:**	09/20/2019
MFG Lot:	TNB: 05/09/2018	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Pipette ID:	Not Provided	**Verify Date:**		**Lab Lot:**	CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER
ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

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125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INC-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

** For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

RIGHT SOLUTIONS | RIGHT PARTNER

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March 26, 2020

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18101079**

Laboratory Results for: **LHAAP 16**

Dear Susan,

ALS Environmental received 2 sample(s) on Oct 19, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA

RJ Modashia
Project Manager

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
Work Order: HS18101079

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18101079-01	16TB07-101018	Water	VBLKW 092618-47	18-Oct-2018 11:30	19-Oct-2018 08:50	☐
HS18101079-02	16WW48-181018	Groundwater		18-Oct-2018 12:40	19-Oct-2018 08:50	☐

Revision:1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
Work Order: HS18101079

CASE NARRATIVE

Work Order Comments

- Revised to update the VOC list
- 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.

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.
- The analysis for TOC was subcontracted to ALS Kelso WA. Final report attached.

GC Semivolatiles by Method RSK-175

Batch ID: R326129

Sample ID: HS18101079-02DUP

- Duplicate RPD was below the control limits.

GCMS Volatiles by Method SW8260

Batch ID: R325941

Sample ID: CCV

- Bromomethane exceeded %D limits on CCV. Samples ND.

Sample ID: HS18101139-07MS

- MS and MSD are for an unrelated sample.

Batch ID: R326114

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SM2320B

Batch ID: R325855

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R325867

Sample ID: HS18101069-01MS

- MS and MSD are for an unrelated sample (Bromide)

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
Sample ID: 16TB07-101018
Collection Date: 18-Oct-2018 11:30

ANALYTICAL REPORT
WorkOrder:HS18101079
Lab ID:HS18101079-01
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	23-Oct-2018 01:06
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 01:06
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 01:06
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 01:06
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	23-Oct-2018 01:06
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 01:06
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	23-Oct-2018 01:06
Surr: 1,2-Dichloroethane-d4	*93.5*			**0**	*70-126*	*%REC*	*1*	*23-Oct-2018 01:06*
Surr: 4-Bromofluorobenzene	*99.1*			**0**	*81-113*	*%REC*	*1*	*23-Oct-2018 01:06*
Surr: Dibromofluoromethane	*96.4*			**0**	*77-123*	*%REC*	*1*	*23-Oct-2018 01:06*
Surr: Toluene-d8	*93.3*			**0**	*82-127*	*%REC*	*1*	*23-Oct-2018 01:06*

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
Sample ID: 16WW48-181018
Collection Date: 18-Oct-2018 12:40

ANALYTICAL REPORT
WorkOrder:HS18101079
Lab ID:HS18101079-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
LOW LEVEL VOLATILES BY SW8260C		**Method:SW8260**						Analyst: AKP
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	23-Oct-2018 04:52
1,1-Dichloroethene	**11**		**0.20**	**0.50**	**1.0**	**ug/L**	1	23-Oct-2018 04:52
1,2-Dichloroethane	**12**		**0.20**	**0.50**	**1.0**	**ug/L**	1	23-Oct-2018 04:52
cis-1,2-Dichloroethene	**2,600**		**20**	**50**	**100**	**ug/L**	100	24-Oct-2018 22:27
Methylene chloride	1.0	U	1.0	1.0	2.0	ug/L	1	23-Oct-2018 04:52
Trichloroethene	**8,800**		**20**	**50**	**100**	**ug/L**	100	24-Oct-2018 22:27
Vinyl chloride	**15**		**0.20**	**0.50**	**1.0**	**ug/L**	1	23-Oct-2018 04:52
Surr: 1,2-Dichloroethane-d4	*100*			**0**	*70-126*	*%REC*	*1*	*23-Oct-2018 04:52*
Surr: 1,2-Dichloroethane-d4	*91.7*			**0**	*70-126*	*%REC*	*100*	*24-Oct-2018 22:27*
Surr: 4-Bromofluorobenzene	*99.7*			**0**	*81-113*	*%REC*	*1*	*23-Oct-2018 04:52*
Surr: 4-Bromofluorobenzene	*98.4*			**0**	*81-113*	*%REC*	*100*	*24-Oct-2018 22:27*
Surr: Dibromofluoromethane	*97.6*			**0**	*77-123*	*%REC*	*1*	*23-Oct-2018 04:52*
Surr: Dibromofluoromethane	*96.2*			**0**	*77-123*	*%REC*	*100*	*24-Oct-2018 22:27*
Surr: Toluene-d8	*90.8*			**0**	*82-127*	*%REC*	*1*	*23-Oct-2018 04:52*
Surr: Toluene-d8	*92.1*			**0**	*82-127*	*%REC*	*100*	*24-Oct-2018 22:27*
DISSOLVED GASES BY RSK-175		**Method:RSK-175**						Analyst: PVL
Ethane	**0.000174**	J	**0.000144**	**0.00100**	**0.00100**	**mg/L**	1	25-Oct-2018 12:05
Ethene	**0.00219**		**0.000234**	**0.00100**	**0.00100**	**mg/L**	1	25-Oct-2018 12:05
Methane	**0.00221**		**0.000107**	**0.000500**	**0.000500**	**mg/L**	1	25-Oct-2018 12:05
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJA
Alkalinity, Total (As CaCO3)	**259**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Oct-2018 18:16
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Bromide	**4.33**		**0.0600**	**0.200**	**0.200**	**mg/L**	2	19-Oct-2018 20:15
Chloride	**1,090**		**10.0**	**25.0**	**25.0**	**mg/L**	50	19-Oct-2018 20:29
Fluoride	**0.181**	J	**0.100**	**0.200**	**0.200**	**mg/L**	2	19-Oct-2018 20:15
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	19-Oct-2018 20:15
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	19-Oct-2018 20:15
Sulfate	**1,770**		**10.0**	**25.0**	**25.0**	**mg/L**	50	19-Oct-2018 20:29
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	01-Nov-2018 14:57
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	**See Attached**		**0**	**0**	**0**		1	01-Nov-2018 11:28

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

DATES REPORT

Sample ID	Client Samp ID	Collection Date	Leachate Date	Prep Date	Analysis Date	DF
Batch ID: R325855 (0)	**Test Name :** ALKALINITY BY SM2320B				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			20 Oct 2018 18:16	1
Batch ID: R325867 (0)	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			19 Oct 2018 20:29	50
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			19 Oct 2018 20:15	2
Batch ID: R325941 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			23 Oct 2018 04:52	1
Batch ID: R325941 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Water	
HS18101079-01	16TB07-101018	18 Oct 2018 11:30			23 Oct 2018 01:06	1
Batch ID: R326114 (0)	**Test Name :** LOW LEVEL VOLATILES BY SW8260C				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			24 Oct 2018 22:27	100
Batch ID: R326129 (0)	**Test Name :** DISSOLVED GASES BY RSK-175				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			25 Oct 2018 12:05	1
Batch ID: R326589 (0)	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			01 Nov 2018 11:28	1
Batch ID: R326624 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Groundwater	
HS18101079-02	16WW48-181018	18 Oct 2018 12:40			01 Nov 2018 14:57	1

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R326129 (0) **Instrument:** FID-4 **Method:** DISSOLVED GASES BY RSK-175

MBLK Sample ID: **MBLK-181025** Units: **mg/L** Analysis Date: **25-Oct-2018 11:51**
Client ID: Run ID: **FID-4_326129** SeqNo: **4792632** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.00100	0.00100								U
Ethene	0.00100	0.00100								U
Methane	0.000500	0.000500								U

LCS Sample ID: **LCS-181025** Units: **mg/L** Analysis Date: **25-Oct-2018 11:11**
Client ID: Run ID: **FID-4_326129** SeqNo: **4792630** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0143	0.00100	0.01804	0	79.4	75 - 125				
Ethene	0.0159	0.00100	0.0168	0	94.9	75 - 125				
Methane	0.00831	0.000500	0.009647	0	86.1	75 - 125				

LCSD Sample ID: **LCSD-181025** Units: **mg/L** Analysis Date: **25-Oct-2018 11:22**
Client ID: Run ID: **FID-4_326129** SeqNo: **4792631** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.0144	0.00100	0.01804	0	79.8	75 - 125	0.01433	0.465	30	
Ethene	0.0133	0.00100	0.0168	0	79.1	75 - 125	0.01593	18.1	30	
Methane	0.00952	0.000500	0.009647	0	98.7	75 - 125	0.008310	13.6	30	

DUP Sample ID: **HS18101079-02DUP** Units: **mg/L** Analysis Date: **25-Oct-2018 12:19**
Client ID: **16WW48-181018** Run ID: **FID-4_326129** SeqNo: **4792634** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Ethane	0.00100	0.00100					0.0001737	0	30	U
Ethene	0.00134	0.00100					0.002189	47.8	30	R
Methane	0.00159	0.000500					0.002213	32.9	30	R

The following samples were analyzed in this batch: HS18101079-02

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** 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

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** 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	*46.3*	*1.0*	*50*	*0*	*92.6*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.52*	*1.0*	*50*	*0*	*99.0*	*82 - 115*				
Surr: Dibromofluoromethane	*49.27*	*1.0*	*50*	*0*	*98.5*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MBLK Sample ID: **VBLKW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:53**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785144** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*46.76*	*1.0*	*50*	*0*	*93.5*	*81 - 120*				

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** 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	20.98	1.0	20	0	105	77 - 118				
1,1,1-Trichloroethane	19.64	1.0	20	0	98.2	70 - 130				
1,1,2,2-Tetrachloroethane	17.96	1.0	20	0	89.8	70 - 120				
1,1,2-Trichlor-1,2,2-trifluoroethane	20.99	1.0	20	0	105	70 - 130				
1,1,2-Trichloroethane	20.41	1.0	20	0	102	77 - 113				
1,1-Dichloroethane	20.53	1.0	20	0	103	71 - 122				
1,1-Dichloroethene	20.06	1.0	20	0	100	70 - 130				
1,1-Dichloropropene	22.5	1.0	20	0	112	78 - 118				
1,2,3-Trichlorobenzene	17.77	1.0	20	0	88.9	70 - 130				
1,2,3-Trichloropropane	17.7	1.0	20	0	88.5	70 - 127				
1,2,4-Trichlorobenzene	18.89	1.0	20	0	94.4	77 - 126				
1,2,4-Trimethylbenzene	21.53	1.0	20	0	108	73 - 121				
1,2-Dibromo-3-chloropropane	16.42	1.0	20	0	82.1	70 - 130				
1,2-Dibromoethane	20.99	1.0	20	0	105	76 - 123				
1,2-Dichlorobenzene	19.8	1.0	20	0	99.0	77 - 113				
1,2-Dichloroethane	22.4	1.0	20	0	112	70 - 124				
1,2-Dichloropropane	21.68	1.0	20	0	108	72 - 119				
1,3,5-Trimethylbenzene	19.63	1.0	20	0	98.1	75 - 118				
1,3-Dichlorobenzene	20.39	1.0	20	0	102	78 - 118				
1,3-Dichloropropane	20.76	1.0	20	0	104	75 - 116				
1,4-Dichlorobenzene	20.48	1.0	20	0	102	79 - 113				
2,2-Dichloropropane	21.26	1.0	20	0	106	70 - 130				
2-Butanone	37.26	2.0	40	0	93.1	70 - 130				
2-Chlorotoluene	21.74	1.0	20	0	109	70 - 128				
2-Hexanone	37.73	2.0	40	0	94.3	70 - 130				
4-Chlorotoluene	22.05	1.0	20	0	110	74 - 126				
4-Isopropyltoluene	18.57	1.0	20	0	92.9	74 - 126				
4-Methyl-2-pentanone	38.58	2.0	40	0	96.4	70 - 130				
Acetone	35.79	2.0	40	0	89.5	70 - 130				
Benzene	20.87	1.0	20	0	104	74 - 120				
Bromobenzene	20.17	1.0	20	0	101	78 - 113				
Bromochloromethane	21.03	1.0	20	0	105	76 - 124				
Bromodichloromethane	21.68	1.0	20	0	108	74 - 122				
Bromoform	20.1	1.0	20	0	100	73 - 128				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	24.27	1.0	20	0	121	70 - 130				
Carbon disulfide	39	2.0	40	0	97.5	70 - 130				
Carbon tetrachloride	21.91	1.0	20	0	110	71 - 125				
Chlorobenzene	21.19	1.0	20	0	106	76 - 113				
Chloroethane	20.22	1.0	20	0	101	70 - 130				
Chloroform	19.9	1.0	20	0	99.5	71 - 121				
Chloromethane	17.84	1.0	20	0	89.2	70 - 129				
cis-1,2-Dichloroethene	20.75	1.0	20	0	104	75 - 122				
cis-1,3-Dichloropropene	22.35	1.0	20	0	112	73 - 127				
Dibromochloromethane	20.66	1.0	20	0	103	77 - 122				
Dibromomethane	21.73	1.0	20	0	109	78 - 121				
Dichlorodifluoromethane	14.06	1.0	20	0	70.3	70 - 130				
Ethylbenzene	22.66	1.0	20	0	113	77 - 117				
Hexachlorobutadiene	19.74	1.0	20	0	98.7	70 - 130				
Isopropylbenzene	20.29	1.0	20	0	101	73 - 127				
m,p-Xylene	45.44	2.0	40	0	114	77 - 122				
Methylene chloride	20.98	2.0	20	0	105	70 - 127				
Naphthalene	15.92	1.0	20	0	79.6	70 - 130				
n-Butylbenzene	20.72	1.0	20	0	104	72 - 130				
n-Propylbenzene	22.1	1.0	20	0	111	73 - 124				
o-Xylene	22.51	1.0	20	0	113	75 - 119				
sec-Butylbenzene	19.08	1.0	20	0	95.4	73 - 128				
Styrene	21.44	1.0	20	0	107	72 - 126				
tert-Butylbenzene	21.37	1.0	20	0	107	73 - 124				
Tetrachloroethene	20.51	1.0	20	0	103	76 - 119				
Toluene	20.48	1.0	20	0	102	77 - 118				
trans-1,2-Dichloroethene	21.45	1.0	20	0	107	72 - 127				
trans-1,3-Dichloropropene	22.37	1.0	20	0	112	77 - 119				
Trichloroethene	20.69	1.0	20	0	103	77 - 121				
Trichlorofluoromethane	20.23	1.0	20	0	101	70 - 130				
Vinyl chloride	19.59	1.0	20	0	98.0	70 - 130				
Surr: 1,2-Dichloroethane-d4	*48.23*	*1.0*	*50*	*0*	*96.5*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*50.84*	*1.0*	*50*	*0*	*102*	*82 - 115*				
Surr: Dibromofluoromethane	*47.26*	*1.0*	*50*	*0*	*94.5*	*73 - 126*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

LCS Sample ID: **VLCSW-181022** Units: **ug/L** Analysis Date: **22-Oct-2018 23:04**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785142** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*45.21*	*1.0*	*50*	*0*	*90.4*	*81 - 120*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** 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	19.41	1.0	20	0	97.0	70 - 120				
1,1,1-Trichloroethane	19.4	1.0	20	0	97.0	70 - 130				
1,1,2,2-Tetrachloroethane	17.37	1.0	20	0	86.9	70 - 123				
1,1,2-Trichlor-1,2,2-trifluoroethane	22.03	1.0	20	0	110	70 - 130				
1,1,2-Trichloroethane	19.17	1.0	20	0	95.9	70 - 117				
1,1-Dichloroethane	19.29	1.0	20	0	96.5	70 - 127				
1,1-Dichloroethene	19.68	1.0	20	0	98.4	70 - 130				
1,1-Dichloropropene	21.95	1.0	20	0	110	70 - 129				
1,2,3-Trichlorobenzene	16.44	1.0	20	0	82.2	70 - 130				
1,2,3-Trichloropropane	17.16	1.0	20	0	85.8	70 - 130				
1,2,4-Trichlorobenzene	17.6	1.0	20	0	88.0	70 - 125				
1,2,4-Trimethylbenzene	61.55	1.0	20	43.59	89.8	70 - 125				
1,2-Dibromo-3-chloropropane	16.6	1.0	20	0	83.0	70 - 130				
1,2-Dibromoethane	19.67	1.0	20	0	98.3	70 - 124				
1,2-Dichlorobenzene	18.3	1.0	20	0	91.5	70 - 115				
1,2-Dichloroethane	20.17	1.0	20	0	101	70 - 127				
1,2-Dichloropropane	20.54	1.0	20	0	103	70 - 122				
1,3,5-Trimethylbenzene	30.62	1.0	20	12.44	90.9	70 - 126				
1,3-Dichlorobenzene	18.83	1.0	20	0	94.1	70 - 119				
1,3-Dichloropropane	19.02	1.0	20	0	95.1	70 - 121				
1,4-Dichlorobenzene	18.72	1.0	20	0	93.6	70 - 114				
2,2-Dichloropropane	20.55	1.0	20	0	103	70 - 130				
2-Butanone	38.86	2.0	40	0	97.1	70 - 130				
2-Chlorotoluene	23.52	1.0	20	0	118	70 - 130				
2-Hexanone	38.24	2.0	40	0	95.6	70 - 130				
4-Chlorotoluene	21.57	1.0	20	0	108	70 - 130				
4-Isopropyltoluene	18.47	1.0	20	0	92.3	70 - 130				
4-Methyl-2-pentanone	38.16	2.0	40	0	95.4	70 - 130				
Acetone	38.75	2.0	40	0	96.9	70 - 130				
Benzene	181	1.0	20	166.5	72.4	70 - 127				O
Bromobenzene	18.48	1.0	20	0	92.4	70 - 115				
Bromochloromethane	20.63	1.0	20	0	103	70 - 127				
Bromodichloromethane	20.54	1.0	20	0	103	70 - 124				
Bromoform	18.6	1.0	20	0	93.0	70 - 129				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.17	1.0	20	0	101	70 - 130				
Carbon disulfide	40.08	2.0	40	0	100	70 - 130				
Carbon tetrachloride	22.3	1.0	20	0	111	70 - 130				
Chlorobenzene	19.87	1.0	20	0	99.4	70 - 114				
Chloroethane	19.12	1.0	20	0	95.6	70 - 130				
Chloroform	19.62	1.0	20	0	98.1	70 - 125				
Chloromethane	15.44	1.0	20	0	77.2	70 - 130				
cis-1,2-Dichloroethene	20.24	1.0	20	0	101	70 - 128				
cis-1,3-Dichloropropene	20.64	1.0	20	0	103	70 - 125				
Dibromochloromethane	19.47	1.0	20	0	97.3	70 - 124				
Dibromomethane	20.21	1.0	20	0	101	70 - 124				
Dichlorodifluoromethane	14.4	1.0	20	0	72.0	70 - 130				
Ethylbenzene	75.37	1.0	20	55.91	97.3	70 - 124				
Hexachlorobutadiene	17.18	1.0	20	0	85.9	70 - 130				
Isopropylbenzene	25.53	1.0	20	6.06	97.3	70 - 130				
m,p-Xylene	248.5	2.0	40	210.2	95.9	70 - 130				O
Methylene chloride	18.9	2.0	20	0	94.5	70 - 128				
Naphthalene	26.9	1.0	20	5.256	108	70 - 130				
n-Butylbenzene	20.25	1.0	20	0	101	70 - 130				
n-Propylbenzene	26.25	1.0	20	2.169	120	70 - 130				
o-Xylene	123.6	1.0	20	102.9	104	70 - 124				O
sec-Butylbenzene	18.85	1.0	20	0.6856	90.8	70 - 130				
Styrene	21.79	1.0	20	0	109	70 - 130				
tert-Butylbenzene	20.62	1.0	20	0	103	70 - 130				
Tetrachloroethene	19.94	1.0	20	0	99.7	70 - 130				
Toluene	21.22	1.0	20	1.768	97.3	70 - 123				
trans-1,2-Dichloroethene	20.6	1.0	20	0	103	70 - 130				
trans-1,3-Dichloropropene	20.59	1.0	20	0	103	70 - 121				
Trichloroethene	26.83	1.0	20	0	134	70 - 129				S
Trichlorofluoromethane	20.86	1.0	20	0	104	70 - 130				
Vinyl chloride	19.93	1.0	20	0	99.7	70 - 130				
Surr: 1,2-Dichloroethane-d4	*50.27*	*1.0*	*50*	*0*	*101*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*50.87*	*1.0*	*50*	*0*	*102*	*81 - 113*				
Surr: Dibromofluoromethane	*47.55*	*1.0*	*50*	*0*	*95.1*	*77 - 123*				

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MS Sample ID: **HS18101139-07MS** Units: **ug/L** Analysis Date: **23-Oct-2018 03:38**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785151** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.73*	*1.0*	*50*	*0*	*89.5*	*82 - 127*				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** 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	19.51	1.0	20	0	97.6	70 - 120	19.41	0.545	20	
1,1,1-Trichloroethane	18.79	1.0	20	0	94.0	70 - 130	19.4	3.19	20	
1,1,2,2-Tetrachloroethane	17.04	1.0	20	0	85.2	70 - 123	17.37	1.92	20	
1,1,2-Trichlor-1,2,2-trifluoroethane	21.24	1.0	20	0	106	70 - 130	22.03	3.67	20	
1,1,2-Trichloroethane	19.25	1.0	20	0	96.2	70 - 117	19.17	0.375	20	
1,1-Dichloroethane	19.05	1.0	20	0	95.3	70 - 127	19.29	1.27	20	
1,1-Dichloroethene	18.7	1.0	20	0	93.5	70 - 130	19.68	5.12	20	
1,1-Dichloropropene	21.31	1.0	20	0	107	70 - 129	21.95	2.97	20	
1,2,3-Trichlorobenzene	17.51	1.0	20	0	87.6	70 - 130	16.44	6.3	20	
1,2,3-Trichloropropane	16.89	1.0	20	0	84.4	70 - 130	17.16	1.61	20	
1,2,4-Trichlorobenzene	18.72	1.0	20	0	93.6	70 - 125	17.6	6.18	20	
1,2,4-Trimethylbenzene	61.24	1.0	20	43.59	88.2	70 - 125	61.55	0.505	20	
1,2-Dibromo-3-chloropropane	15.91	1.0	20	0	79.5	70 - 130	16.6	4.27	20	
1,2-Dibromoethane	20.02	1.0	20	0	100	70 - 124	19.67	1.78	20	
1,2-Dichlorobenzene	18.41	1.0	20	0	92.1	70 - 115	18.3	0.633	20	
1,2-Dichloroethane	20	1.0	20	0	100.0	70 - 127	20.17	0.868	20	
1,2-Dichloropropane	0.5000	1.0	20	0	0	70 - 122	20.54	0	20	SU
1,3,5-Trimethylbenzene	29.85	1.0	20	12.44	87.1	70 - 126	30.62	2.53	20	
1,3-Dichlorobenzene	18.95	1.0	20	0	94.7	70 - 119	18.83	0.622	20	
1,3-Dichloropropane	19.72	1.0	20	0	98.6	70 - 121	19.02	3.59	20	
1,4-Dichlorobenzene	18.92	1.0	20	0	94.6	70 - 114	18.72	1.02	20	
2,2-Dichloropropane	19.62	1.0	20	0	98.1	70 - 130	20.55	4.62	20	
2-Butanone	38.43	2.0	40	0	96.1	70 - 130	38.86	1.1	20	
2-Chlorotoluene	23.1	1.0	20	0	116	70 - 130	23.52	1.78	20	
2-Hexanone	38.81	2.0	40	0	97.0	70 - 130	38.24	1.49	20	
4-Chlorotoluene	21.41	1.0	20	0	107	70 - 130	21.57	0.73	20	
4-Isopropyltoluene	18.2	1.0	20	0	91.0	70 - 130	18.47	1.48	20	
4-Methyl-2-pentanone	37.86	2.0	40	0	94.6	70 - 130	38.16	0.788	20	
Acetone	37.12	2.0	40	0	92.8	70 - 130	38.75	4.29	20	
Benzene	176.2	1.0	20	166.5	48.2	70 - 127	181	2.7	20	SO
Bromobenzene	18.46	1.0	20	0	92.3	70 - 115	18.48	0.0757	20	
Bromochloromethane	20.08	1.0	20	0	100	70 - 127	20.63	2.68	20	
Bromodichloromethane	20.57	1.0	20	0	103	70 - 124	20.54	0.16	20	
Bromoform	18.81	1.0	20	0	94.1	70 - 129	18.6	1.15	20	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325941 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromomethane	20.56	1.0	20	0	103	70 - 130	20.17	1.91	20	
Carbon disulfide	37.77	2.0	40	0	94.4	70 - 130	40.08	5.93	20	
Carbon tetrachloride	20.71	1.0	20	0	104	70 - 130	22.3	7.36	20	
Chlorobenzene	20.38	1.0	20	0	102	70 - 114	19.87	2.51	20	
Chloroethane	20.74	1.0	20	0	104	70 - 130	19.12	8.11	20	
Chloroform	18.96	1.0	20	0	94.8	70 - 125	19.62	3.4	20	
Chloromethane	15.67	1.0	20	0	78.3	70 - 130	15.44	1.47	20	
cis-1,2-Dichloroethene	19.73	1.0	20	0	98.6	70 - 128	20.24	2.57	20	
cis-1,3-Dichloropropene	20.93	1.0	20	0	105	70 - 125	20.64	1.37	20	
Dibromochloromethane	19.42	1.0	20	0	97.1	70 - 124	19.47	0.244	20	
Dibromomethane	20.66	1.0	20	0	103	70 - 124	20.21	2.2	20	
Dichlorodifluoromethane	14.09	1.0	20	0	70.4	70 - 130	14.4	2.23	20	
Ethylbenzene	75.65	1.0	20	55.91	98.7	70 - 124	75.37	0.358	20	
Hexachlorobutadiene	16.59	1.0	20	0	83.0	70 - 130	17.18	3.49	20	
Isopropylbenzene	25.15	1.0	20	6.06	95.5	70 - 130	25.53	1.48	20	
m,p-Xylene	249	2.0	40	210.2	97.1	70 - 130	248.5	0.187	20	O
Methylene chloride	18.53	2.0	20	0	92.7	70 - 128	18.9	1.96	20	
Naphthalene	28.74	1.0	20	5.256	117	70 - 130	26.9	6.61	20	
n-Butylbenzene	19.84	1.0	20	0	99.2	70 - 130	20.25	2	20	
n-Propylbenzene	25.31	1.0	20	2.169	116	70 - 130	26.25	3.62	20	
o-Xylene	123.5	1.0	20	102.9	103	70 - 124	123.6	0.113	20	O
sec-Butylbenzene	18.22	1.0	20	0.6856	87.7	70 - 130	18.85	3.44	20	
Styrene	22.52	1.0	20	0	113	70 - 130	21.79	3.29	20	
tert-Butylbenzene	20.03	1.0	20	0	100	70 - 130	20.62	2.92	20	
Tetrachloroethene	19.39	1.0	20	0	96.9	70 - 130	19.94	2.83	20	
Toluene	21.02	1.0	20	1.768	96.3	70 - 123	21.22	0.942	20	
trans-1,2-Dichloroethene	19.86	1.0	20	0	99.3	70 - 130	20.6	3.63	20	
trans-1,3-Dichloropropene	21.55	1.0	20	0	108	70 - 121	20.59	4.54	20	
Trichloroethene	22.9	1.0	20	0	115	70 - 129	26.83	15.8	20	
Trichlorofluoromethane	19.67	1.0	20	0	98.3	70 - 130	20.86	5.91	20	
Vinyl chloride	18.77	1.0	20	0	93.9	70 - 130	19.93	5.98	20	
Surr: 1,2-Dichloroethane-d4	*47.89*	*1.0*	*50*	*0*	*95.8*	*70 - 126*	*50.27*	*4.85*	*20*	
Surr: 4-Bromofluorobenzene	*52.06*	*1.0*	*50*	*0*	*104*	*81 - 113*	*50.87*	*2.32*	*20*	
Surr: Dibromofluoromethane	*47.8*	*1.0*	*50*	*0*	*95.6*	*77 - 123*	*47.55*	*0.523*	*20*	

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R325941 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18101139-07MSD** Units: **ug/L** Analysis Date: **23-Oct-2018 04:03**
Client ID: Run ID: **VOA2_325941** SeqNo: **4785152** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Surr: Toluene-d8	*44.94*	*1.0*	*50*	*0*	*89.9*	*82 - 127*	*44.73*	*0.476*	*20*	

The following samples were analyzed in this batch: HS18101079-01 HS18101079-02

Revision: 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R326114 (0) **Instrument:** VOA2 **Method:** LOW LEVEL VOLATILES BY SW8260C

MBLK Sample ID: **VBLKW-181024** Units: **ug/L** Analysis Date: **24-Oct-2018 13:35**
Client ID: Run ID: **VOA2_326114** SeqNo: **4788873** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	0.50	1.0								U
Trichloroethene	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*46.05*	*1.0*	*50*	*0*	*92.1*	*70 - 123*				
Surr: 4-Bromofluorobenzene	*49.12*	*1.0*	*50*	*0*	*98.2*	*82 - 115*				
Surr: Dibromofluoromethane	*49.21*	*1.0*	*50*	*0*	*98.4*	*73 - 126*				
Surr: Toluene-d8	*46.29*	*1.0*	*50*	*0*	*92.6*	*81 - 120*				

LCS Sample ID: **VLCSW-181024** Units: **ug/L** Analysis Date: **24-Oct-2018 13:11**
Client ID: Run ID: **VOA2_326114** SeqNo: **4788872** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	21.63	1.0	20	0	108	75 - 122				
Trichloroethene	21.43	1.0	20	0	107	77 - 121				
Surr: 1,2-Dichloroethane-d4	*48.81*	*1.0*	*50*	*0*	*97.6*	*70 - 130*				
Surr: 4-Bromofluorobenzene	*51.4*	*1.0*	*50*	*0*	*103*	*82 - 115*				
Surr: Dibromofluoromethane	*47.62*	*1.0*	*50*	*0*	*95.2*	*73 - 126*				
Surr: Toluene-d8	*44.82*	*1.0*	*50*	*0*	*89.6*	*81 - 120*				

MS Sample ID: **HS18101128-11MS** Units: **ug/L** Analysis Date: **24-Oct-2018 16:51**
Client ID: Run ID: **VOA2_326114** SeqNo: **4788875** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	20.63	1.0	20	0	103	70 - 128				
Trichloroethene	20.51	1.0	20	0	103	70 - 129				
Surr: 1,2-Dichloroethane-d4	*48.17*	*1.0*	*50*	*0*	*96.3*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*51.06*	*1.0*	*50*	*0*	*102*	*81 - 113*				
Surr: Dibromofluoromethane	*47.56*	*1.0*	*50*	*0*	*95.1*	*77 - 123*				
Surr: Toluene-d8	*45.37*	*1.0*	*50*	*0*	*90.7*	*82 - 127*				

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R326114 (0)** **Instrument:** **VOA2** **Method:** **LOW LEVEL VOLATILES BY SW8260C**

MSD Sample ID: **HS18101128-11MSD** Units: **ug/L** Analysis Date: **24-Oct-2018 17:15**
Client ID: Run ID: **VOA2_326114** SeqNo: **4788876** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
cis-1,2-Dichloroethene	19.44	1.0	20	0	97.2	70 - 128	20.63	5.96	20	
Trichloroethene	19.47	1.0	20	0	97.4	70 - 129	20.51	5.21	20	
Surr: 1,2-Dichloroethane-d4	*47.79*	*1.0*	*50*	*0*	*95.6*	*70 - 126*	*48.17*	*0.807*	*20*	
Surr: 4-Bromofluorobenzene	*51.74*	*1.0*	*50*	*0*	*103*	*81 - 113*	*51.06*	*1.31*	*20*	
Surr: Dibromofluoromethane	*48.16*	*1.0*	*50*	*0*	*96.3*	*77 - 123*	*47.56*	*1.25*	*20*	
Surr: Toluene-d8	*44.82*	*1.0*	*50*	*0*	*89.6*	*82 - 127*	*45.37*	*1.23*	*20*	

The following samples were analyzed in this batch: HS18101079-02

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325855 (0) **Instrument:** ManTech01 **Method:** ALKALINITY BY SM2320B

MBLK Sample ID: **WBLKW1-181020** Units: **mg/L** Analysis Date: **20-Oct-2018 17:26**
Client ID: Run ID: **ManTech01_325855** SeqNo: **4782938** 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

LCS Sample ID: **WLCS1-181020** Units: **mg/L** Analysis Date: **20-Oct-2018 17:35**
Client ID: Run ID: **ManTech01_325855** SeqNo: **4782939** 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)	1063	5.00	1000	0	106	85 - 115				

LCSD Sample ID: **WLCSD1-181020** Units: **mg/L** Analysis Date: **20-Oct-2018 17:44**
Client ID: Run ID: **ManTech01_325855** SeqNo: **4782940** 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)	1064	5.00	1000	0	106	85 - 115	1063	0.147	20	

DUP Sample ID: **HS18100985-01DUP** Units: **mg/L** Analysis Date: **20-Oct-2018 18:10**
Client ID: Run ID: **ManTech01_325855** SeqNo: **4782944** 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)	16.64	5.00					15.2	9.05	20	

The following samples were analyzed in this batch: HS18101079-02

Revision: 1

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: R325867 (0) **Instrument:** ICS2100 **Method:** ANIONS BY SW9056A

MBLK Sample ID: **WBLKW1-101918** Units: **mg/L** Analysis Date: **19-Oct-2018 14:57**
Client ID: Run ID: **ICS2100_325867** SeqNo: **4783215** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	0.100	0.100								U
Chloride	0.500	0.500								U
Fluoride	0.100	0.100								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

LCS Sample ID: **WLCSW1-101918** Units: **mg/L** Analysis Date: **19-Oct-2018 15:12**
Client ID: Run ID: **ICS2100_325867** SeqNo: **4783216** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.679	0.100	4	0	92.0	80 - 120				
Chloride	20.29	0.500	20	0	101	80 - 120				
Fluoride	4.356	0.100	4	0	109	80 - 120				
Nitrogen, Nitrate (As N)	4.06	0.100	4	0	102	80 - 120				
Nitrogen, Nitrite (As N)	4.223	0.100	4	0	106	80 - 120				
Sulfate	19.81	0.500	20	0	99.1	80 - 120				

LCSD Sample ID: **WLCSDW1-101918** Units: **mg/L** Analysis Date: **19-Oct-2018 15:26**
Client ID: Run ID: **ICS2100_325867** SeqNo: **4783217** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	3.671	0.100	4	0	91.8	80 - 120	3.679	0.218	20	
Chloride	20.3	0.500	20	0	102	80 - 120	20.29	0.064	20	
Fluoride	4.39	0.100	4	0	110	80 - 120	4.356	0.777	20	
Nitrogen, Nitrate (As N)	4.066	0.100	4	0	102	80 - 120	4.06	0.148	20	
Nitrogen, Nitrite (As N)	4.214	0.100	4	0	105	80 - 120	4.223	0.213	20	
Sulfate	19.84	0.500	20	0	99.2	80 - 120	19.81	0.146	20	

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: HS18101079

QC BATCH REPORT

Batch ID: **R325867 (0)** **Instrument:** **ICS2100** **Method:** **ANIONS BY SW9056A**

MS Sample ID: **HS18101069-01MS** Units: **mg/L** Analysis Date: **19-Oct-2018 18:06**
Client ID: Run ID: **ICS2100_325867** SeqNo: **4783221** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	1.801	0.100	2	0.243	77.9	80 - 120				S
Chloride	46.26	0.500	10	36.89	93.6	80 - 120				
Fluoride	2.037	0.100	2	0.058	99.0	80 - 120				
Nitrogen, Nitrate (As N)	3.087	0.100	2	1.149	96.9	80 - 120				
Nitrogen, Nitrite (As N)	1.997	0.100	2	0.058	97.0	80 - 120				
Sulfate	13.24	0.500	10	3.789	94.6	80 - 120				

MSD Sample ID: **HS18101069-01MSD** Units: **mg/L** Analysis Date: **19-Oct-2018 18:21**
Client ID: Run ID: **ICS2100_325867** SeqNo: **4783222** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Bromide	1.849	0.100	2	0.243	80.3	80 - 120	1.801	2.63	20	
Chloride	47.25	0.500	10	36.89	104	80 - 120	46.26	2.12	20	
Fluoride	2.077	0.100	2	0.058	101	80 - 120	2.037	1.94	20	
Nitrogen, Nitrate (As N)	3.173	0.100	2	1.149	101	80 - 120	3.087	2.75	20	
Nitrogen, Nitrite (As N)	2.051	0.100	2	0.058	99.6	80 - 120	1.997	2.67	20	
Sulfate	13.46	0.500	10	3.789	96.7	80 - 120	13.24	1.61	20	

The following samples were analyzed in this batch: HS18101079-02

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ALS Houston, US Date: 26-Mar-20

Client: Aptim Environmental & Infrastucture, Inc.
Project: LHAAP 16
WorkOrder: **HS18101079**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/L	Milligrams per Liter

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231 V009	22-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2020	31-Dec-2020
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-067	31-Aug-2020
Texas	T104704231-19-25	30-Apr-2020

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ALS Houston, US Date: 26-Mar-20

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18101079

Date/Time Received: **19-Oct-2018 08:50**
Received by: **PMG**

Checklist completed by: *Jared R. Makan* eSignature 19-Oct-2018 Date

Reviewed by: *RJ Modashia* eSignature 19-Oct-2018 Date

Matrices: **Water**

Carrier name: **FedEx Priority Overnight**

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	1 Page(s)
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	COC IDs:N/A
Samplers name present on COC?	Yes ☐	No ☑	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

Temperature(s)/Thermometer(s):	2.1c/1.8c UC/C	IR25
Cooler(s)/Kit(s):	43603	
Date/Time sample(s) sent to storage:	10/19/2018 14:20	

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:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID: LHAAP16-OCT2018-GW-ALSHT-181018 TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	fedinvoices@aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-16			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B	Perchlorate in Water by 6850	Anions in Water by E300.0 & Alkalinity in Water by E2320b	Bromide by E300.0	Dissolved Gases in Water by RSK175	TOC in Water by SW9060				
16TB07-181018	FIELD QC				LIQ	10/18/2018	1130	2		2									
16WW48-181018	16WW48	11.87	11.95	FT	GW	10/18/2018	1240	11		3	1	1	1	3	2				

HS18101079

Aptim Environmental & Infrastucture. Inc.

LHAAP 16

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible] APTIM	10-18-18 1655	PMC	10-19-18 0850
			ALS HS	
			cooler # 43603	
			TEMP - 2-6c IR#25 CF-0.3c	

ALS Laboratory Group
10450 Stancliff Rd. Ste#210
Houston, TX 77 '099
281.530.565 6

CUST ODY SEAL
DATE: 2-1+-1+
Signature:
LI HAAP

CUSTODY
DATE: SEAL
Signature: 1+-1+
LHAA
P

ALS Laboratory Gro ip
10450 Stancliff Rd. Ste#210
Houston, TX 77099
281.530.5656

FedEx
TRK# 0221 7376 9751 4863

FRI – 19 OCT 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US IAH

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F : +1 360 636 1068
www.alsglobal.com

November 01, 2018

Analytical Report for Service Request No: K1810282

RJ Modashia
ALS Laboratory Group
10450 Stancliff Road
Suite 210
Houston, TX 77099-4338

RE: HS18101079 / HS18101079

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 20, 2018
For your reference, these analyses have been assigned our service request number **K1810282.**

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. 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.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Kelley Lovejoy

Kelley Lovejoy
Project Manager

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Raw Data
    General Chemistry

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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.

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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.

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water-	-
Kelso Laboratory Website	www.alsglobal.com	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 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/anlayte is offered by that state.

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Case Narrative

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

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1317 South 13th Ave, Kelso, WA 98626 | 1-360-577-7222 | www.alsglobal.com

ALS Environmental

Client: ALS Environmental - US
Project: HS18101079
Sample Matrix: Ground Water

Service Request: K1810282
Date Received: 10/20/2018

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:

One ground water sample was received for analysis at ALS Environmental on 10/20/2018. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by Kelley Lovejoy

Date 11/01/2018

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Chain of Custody

ALS Environmental—Kelso Laboratory
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K1810282

10450 Stancliff Rd, Ste 210
Houston, TX 77099
T: +1 281 530 5656
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Subcontract Chain of Custody

COC ID: 10063

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:	HS18101079
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18101079-02**	**16WW48-181018**	**Groundwater**	**18 Oct 2018 12:40**
	TOC Analysis with DOD Level IV			29 Oct 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: 10/19/18 1800.

Received By: _____ Date/Time: 10-20-18 0900

Cooler ID(s): _____ Temperature(s): _____

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PC KL

Cooler Receipt and Preservation Form

Client ALS- Houston Service Request K18 10282

Received: 10-20-18 Opened: 10-20-18 By: ASP Unloaded: 10-20-18 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 NA	Tracking Number NA	Filed
0.0	0.1	1.9	2.0	+0.1	393	10063	4380 9533 7645	

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

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1810282
Project:	HS18101079/HS18101079	**Date Collected:**	10/18/18
Sample Matrix:	Ground Water	**Date Received:**	10/20/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
16WW48-181018	K1810282-001	**8.78**	0.50	0.20	0.07	1	10/30/18 09:44	
Method Blank	K1810282-MB	ND U	0.50	0.20	0.07	1	10/30/18 11:21	

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810282
Project	HS18101079/HS18101079	**Date Collected:**	10/18/18
Sample Matrix:	Ground Water	**Date Received:**	10/20/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**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
16WW48-181018	K1810282-001DUP	0.50	0.20	0.07	8.78	8.21	8.50	7	10	10/30/18

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.

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dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810282
Project:	HS18101079/HS18101079	**Date Collected:**	N/A
Sample Matrix:	Ground Water	**Date Received:**	N/A
		Date Analyzed:	10/30/18
		Date Extracted:	NA

Duplicate Matrix Spike Summary
Carbon, Total Organic

Sample Name:	Batch QC	**Units:**	mg/L
Lab Code:	K1810023-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

		Matrix Spike K1810023-001MS			**Duplicate Matrix Spike** K1810023-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic	242	2930	2500	107	2820	2500	103	83-117	4	10

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.

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1810282
Project:	HS18101079/HS18101079	**Date Analyzed:**	10/30/18
Sample Matrix:	Ground Water	**Date Extracted:**	NA

Lab Control Sample Summary
Carbon, Total Organic

Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA
		Analysis Lot:	613206

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1810282-LCS	19.8	21.9	91	83-117

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QA/QC Report

Client: ALS Environmental - US **Service Request:** K1810282
Project: HS18101079/HS18101079

Continuing Calibration Verification (CCV) Summary

Carbon, Total Organic

Analysis Method: SM 5310 C **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	613206	KQ1815864-36	10/30/18 04:57	25.0	25.2	101	90-110
CCV2	613206	KQ1815864-37	10/30/18 10:48	25.0	24.7	99	90-110
CCV3	613206	KQ1815864-38	10/30/18 16:24	25.0	24.4	98	90-110
CCV4	613206	KQ1815864-39	10/30/18 22:45	25.0	24.8	99	90-110
CCV5	613206	KQ1815864-40	10/31/18 03:19	25.0	24.9	99	90-110
CCV6	613206	KQ1815864-41	10/31/18 09:08	25.0	24.6	98	90-110

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ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**K1810282
Project: HS18101079/HS18101079

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

Analysis Method: SM 5310 C **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	613206	KQ1815864-42	10/30/18 05:14	0.50	0.20	0.07	ND	U
CCB2	613206	KQ1815864-43	10/30/18 11:04	0.50	0.20	0.07	ND	U
CCB3	613206	KQ1815864-44	10/30/18 16:40	0.50	0.20	0.07	ND	U
CCB4	613206	KQ1815864-45	10/30/18 23:01	0.50	0.20	0.07	ND	U
CCB5	613206	KQ1815864-46	10/31/18 03:35	0.50	0.20	0.07	ND	U
CCB6	613206	KQ1815864-47	10/31/18 09:25	0.50	0.20	0.07	ND	U

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1829354; 1829356; 1829552

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2160 (225755)

General Set Information: There were seven field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: NA

Method QC data: The method blank (LMB 624690) was less than 1/2 the CRDL. The recovery for the LCS (624691) was within acceptable parameters.

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MS/MSD Analysis: MS/MSD was performed on sample 1829354001 (Client ID: HBW7_101718). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. The spike target was 5.µg/L. The percent recoveries and relative percent difference (RPD) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1

Thomas Bosch October 31, 2018
Analyst Date

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ANALYTICAL REPORT

Report Date: November 01, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: 34-1829552
Project ID: HS18101079
Purchase Order: HS18101079
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW48-181018	1829552001	10/18/18	10/20/18	

ANALYTICAL REPORT

Workorder: 34-1829552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID:	16WW48-181018	Sampling Site:	NA	Collected:	10/18/2018
Lab ID:	1829552001	Media:	125 mL Nalgene	Received:	10/20/2018
Matrix:	Water	Sampling Parameter:	NA		

Analysis Method - EPA 6850, DoD QSM

Preparation:	Not Applicable	Analysis:	EPA 6850, DoD QSM Water	Instrument ID:	LCMS04
		Batch:	ELMS/2160 (HBN: 225755)	Percent Solid:	NA
		Analyzed:	10/25/2018 11:53	Report Basis:	Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	14	1.0	2.0	4.0	1	

Report Authorization

(/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 10/25/2018 16:34	/S/ Stephen Brose 11/01/2018 07:58

Laboratory Contact Information

ALS Environmental
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Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

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ANALYTICAL REPORT

Workorder: 34-1829552
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1829552

Limits:	Client SOW/Contract Specified	Preparation:	NA	Analysis:	EPA 6850, DoD QSM
Basis:	DoD QSM	Batch:	NA	Batch:	ELMS/2160 (HBN: 225755)
		Prepared By:	NA	Analyzed By:	Thomas Bosch

Blank

LMB: 624690
Analyzed: 10/25/2018 09:02
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 624691
Analyzed: 10/25/2018 09:18
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	4.89	5.00	97.7	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample:	1829354001	MS:	624692				MSD:	624693			
Analyzed:	10/25/2018 10:00	Analyzed:	10/25/2018 10:14				Analyzed:	10/25/2018 10:28			
Dilution:	1	Dilution:	1				Dilution:	1			
Units:	ug/L	Units:	ug/L				Units:	ug/L			
Analyte	Result	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Perchlorate	ND	4.83	5	96.6	78.8	123.8	5.03	101	4.09	0.0	20.0

Continuing Calibration Verification

CCV:	624687			CCV:	624694	
Analyzed:	10/25/2018 08:14			Analyzed:	10/25/2018 12:10	
Units:	ug/L			Units:	ug/L	
Criteria:	± 15%			Criteria:	± 15%	
Analyte	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	24.4	25.0	97.5	23.3	25.0	93.1

Interference Check Sample

ICSA: 624689
Analyzed: 10/25/2018 08:48
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	1.01	1.00	101

Limit of Detection Verification

LODV:	624688			LODV:	624695	
Analyzed:	10/25/2018 08:34			Analyzed:	10/25/2018 12:24	
Units:	ug/L			Units:	ug/L	
Criteria:	± 50%			Criteria:	± 50%	
Analyte	Result	Target	% Rec.	Result	Target	% Rec.
Perchlorate	1.02	1.00	102	0.996	1.00	99.6

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Quality Control Sample
Batch Report

Analysis Information

Workorder: 1829552

Limits:	Client SOW/Contract Specified	Preparation:	NA	Analysis:	EPA 6850, DoD QSM
Basis:	DoD QSM	Batch:	NA	Batch:	ELMS/2160 (HBN: 225755)
		Prepared By:	NA	Analyzed By:	Thomas Bosch

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
10/25/2018 16:34	11/01/2018 07:58

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ⬢ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

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18698/#2

1829552

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Subcontract Chain of Custody

COC ID: 10064

1829552

SUBCONTRACT TO:

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Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:	HS18101079
TSR:	Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18101079-02**	**16WW48-181018**	**Groundwater**	**18 Oct 2018 12:40**
	SUB_Perch-6850			29 Oct 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: 10/19/18 1800.

Received By: _____ Date/Time: 10/20/18 / 928

Cooler ID(s): 8 857 Temperature(s): 2°

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ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS18101079	Split:	Workorder ID: 1829552	Level: ENV_LVL4
Client: ALS Environmental (Houston)		Account: 8101	Type: 125Poly
Comments:			Preservatives: COOL

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	Requested Analysis: EPA 6850, DoD QSM
1	10/18/2018 12:40	16WW48-181018	1829552001		Water	A	1	A
2								
3								
4								
5								
6								
7								
8								
9								
10								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	10/20/2018 09:28	ALS Sample Receiving	Sample Login
[signature]	10/22/18 1205	3C	storage
R.33.1	10-24-18/13:35	T.Bond	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: 1829552

Date/Time of Receipt: 10/20/18 1928

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8854	2 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: [signature] (Signature) Meredith Edwards (Printed Name) 10/20/18 (Date)

CLIENT-RELATED INFORMATION

☐ Missing Cooler	☐ Missing Samples/Bottles	☐ Incorrect Preservation	☐ Insufficient Sample Volume
☐ Cooler Conditions	☐ Broken/Leaking Samples	☐ pH Criteria Not Met	☐ Chain of Custody Problems
☐ Missing Paperwork	☐ Incorrect Bottle Type	☐ Residual Chlorine Present	☐ Other:
☐ Missing/Incorrect Bottle Labels	☐ Cooler Temperatures Out of Range	☐ Head Space in Bottles	

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

ORIGIN ID:SGRA (281) 530-5656
CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 19OCT18
ACTWGT: 9.20 LB
CAD: 300130/CAFE3211
DIMS: 14x11x10 IN

BILL THIRD PARTY

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS18101079-RJ

FedEx Express

E

SATURDAY 12:00P
PRIORITY OVERNIGHT

TRK# 0201 4380 9533 7732

XO BTFA

84123
UT-US SLC

FedEx Express

FedEx S

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Batch Worklist

Batch: ELMS/ 2160 **Created:** 10/25/2018 07:44 **Instrument:** **HBN:** 225755

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1829354 [ENV_LVL4]
Workorder: 1829356 [ENV_LVL4]
Workorder: 1829552 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	624687	CCV for HBN 225755 [ELMS/2160]				CCV	3		E685041C3Q	5311		11/1/2018	
2	624688	LODV for HBN 225755 [ELMS/2160				LODV	3		E6850..D3Q	5311		11/1/2018	
3	624689	ICS for HBN 225755 [ELMS/2160]				ICS	3		E6850..D3Q	5311		11/1/2018	
4	624690	LMB for HBN 225755 [ELMS/2160]				LMB	3		E6850Q413Q	5311		11/1/2018	
5	624691	LCS for HBN 225755 [ELMS/2160]				LCS	3		E6850Q413Q	5311		11/1/2018	
6	1829354001	HBW7_101718				SAMPLE	3	1829354001-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
7	624692	HBW7_101718(1829354001MS)				MS	3		E6850Q413Q	5311		11/1/2018	
8	624693	HBW7_101718(1829354001MSD)				MSD	3		E6850Q413Q	5311		11/1/2018	
9	1829354002	HBW10_101718				SAMPLE	3	1829354002-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
10	1829354003	HBW1_101718				SAMPLE	3	1829354003-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
11	1829354004	GPW1_101718				SAMPLE	3	1829354004-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
12	1829354005	GPW3_101718				SAMPLE	3	1829354005-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
13	1829356001	LH18/24-SP650_101718_BIX				SAMPLE	3	1829356001-A	E6850Q41.3	5480	11/14/2018	11/1/2018	
14	1829552001	16WW48-181018				SAMPLE	3	1829552001-A	E6850Q41.3	5480	11/15/2018	11/1/2018	
15	624694	CCV for HBN 225755 [ELMS/2160]				CCV	3		E685041C3Q	5311		11/1/2018	
16	624695	LODV for HBN 225755 [ELMS/2160				LODV	3		E6850..D3Q	5311		11/1/2018	

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ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

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ALS Work Order #'s & Sample #( )'s: 1829354 (001-05); 1829356 (001); 1829552 (001)
ELMS Batch/HBN ID: 2160 (225755)
Prep Date: 10/24/2018 Analysis Date: 10/25/2018 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2018\OCT\25OCT18D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:
Water: Samples were prepared by TNB. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/ 5% ACN (B&J Lot AH015-4)/0.1% glacial acetic acid (JT-Baker Lot 04802).
Eluent B1: 95% ACN (B&J Lot AH015-4)/ 5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 04802).

STANDARDS: Internal Standard Spiking Solution Horizon# 43730. Dilutions of Working Standard Solution ID 43702 used for CCV's, LODV's, RLVS and IPC.

CALIBRATION CURVE: Used curve from 10/08/2018, sequence 08OCT18D.s Offline Quantitation Method: CLO4-DPR.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 2 Injection Volume: 25µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.80
5.0	0.80
5.3	0.25
10.0	0.25
10.5	0.80
12.5	0.80

QC DATA: 5.0µL of QC Solution Horizon ID 41830 was used for LCS 624691; Target = 5.0µg/L. ASTM type II water was used for LMB 624690.

MS/MSD: MS/MSD was performed on sample 1829354001 (Client ID: HBW7_101718). 5.0µl of Working Standard Solution Horizon ID 43701 was added to 10.0mL of sample preparation. Spike target = 5.0µg/L.

COMMENTS:
1) Results reported in µg/L.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2018\OCT\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2018\225755-DOD-ALS-HSTN-LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#

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5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS 2160 HBN: 325755 **Sample Set IDs if Applicable:** 1829354 / 1829356 / 1829552	**Analyst Initials**	**Reviewer Initials**
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Method Blanks analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable flags applied on QC reports; LCSs analyzed and meet acceptance criteria when performed	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness checked	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#	—	—
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

TB 10-31-18

SB 11/1/18

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ALS

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 43702
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43701	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	09/18/2019

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STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK — **Description - 6850 Stock AccStd 1,000ug/mL**

Standard: 43659
MFG: AccuStandard
MFG Lot: 218065075
Part ID: IC-PER-10X-1

Created By: Thomas Bosch
Create Date: 09/17/2018 09:09AM

Amount: 100 mL
Expires: 07/25/2020
Usable: No
Lab Lot: CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O			Description - ASTM Type II Water
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L	
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025	
MFG Lot: Not Provided		**Usable:** Yes	
Part ID: Not Provided		**Lab Lot:** LAB 109	

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 43701
MFG: ALS/SLC
MFG Lot: TNB: 09/18/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/18/2018 02:09PM

Amount: 10 mL
Expires: 09/18/2019
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

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STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 41831
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
41830	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	05/09/2019

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STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description** - 6850 QC Intrmdt Std-QC 10ug/mL

Standard: 41830
MFG: ALS/SLC
MFG Lot: TNB: 05/09/2018
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/09/2018 10:05AM

Amount: 10 mL
Expires: 05/09/2019
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

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STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O		Description - ASTM Type II Water
Standard: 109	Created By: ALS Support (Lims)	Amount: 1000 L
MFG: DCL In House	Create Date: 10/06/2005 09:10AM	Expires: 11/07/2025
MFG Lot: Not Provided		Usable: Yes
Part ID: Not Provided		Lab Lot: LAB 109

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

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STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description: 6850 QC Stock STD 1,000ug/mL**

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

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STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK		**Description - Perchlorate ISTD Wrk 1,000ug/L**
Standard: **43730**	**Created By:** Thomas Bosch	**Amount:** 25 mL
MFG: ALS/SLC	**Create Date:** 09/20/2018 09:09AM	**Expires:** 09/20/2019
MFG Lot: TNB: 05/09/2018	**Verified By:** Thomas Bosch	**Usable:** Yes
Pipette ID: Not Provided	**Verify Date:**	**Lab Lot:** CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
43729	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	04/28/2026

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STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK		Description - Perchlorate ISTD Stock
Standard: 43729	**Created By:** Thomas Bosch	**Amount:** 1 mL
MFG: Cambridge Isotope	**Create Date:** 09/20/2018 09:09AM	**Expires:** 04/28/2026
MFG Lot: SDFF-012A	**Verified By:** Thomas Bosch	**Usable:** Yes
Part ID: OLM-7310-S	**Verify Date:**	**Lab Lot:** CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED PRODUCER REFERENCE MATERIAL PRODUCER
ANAB ACCREDITED PRODUCER TESTING LABORATORY

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ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

125 Market Street
New Haven, CT 06513
USA

AccuStandard®

Tel (203)786-5290
Fax (203)786-5287
www.AccuStandard.com

CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)

Included on ISO/IEC 17025 Scope of Accreditation: Yes

Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

AccuStandard

The gravimetric uncertainty for this product is ±0.24%.

The final solution was checked against an independent standard to verify its concentration.

We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.

All solutions are filtered through a 0.2 µm filter prior to being bottled.

All glassware used in preparation is Class A and calibrated regularly.

All weights are traceable through NIST, Test No. 822-275872-11

All bottles are triple rinsed with deionized water prior to use.

Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.

We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

Quality Standards:
ISO Guide 34 • ISO/IEC 17025 • ISO 13485 • cGMP

23118

Product Name: (Isotopic Label & Enrichment Specification)	PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER
Lot Number:	SDDG-013
Catalog Number:	OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
MW*:	130.4
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number. Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

* *For isotopically labeled compounds, MW listed is for the fully enriched product.*

Approved by: T. J. Eckersley

Timothy J. Eckersley, Ph.D., Quality Assurance

Quality Control Tests and Results

QC Release Date	2/27/2014
Expiration Date	2/27/2024
Concentration Based on Gravimetry	102 µg/mL
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	109.4 ± 2.8 µg/mL (k=2)

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10450 Stancliff Rd. Suite 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887

August 13, 2019

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS18111186**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 4 sample(s) on Nov 20, 2018 for the analysis presented in the following report.

This is a REVISED REPORT. Please see the Case Narrative for discussion concerning this revision.

Regards,

Generated By: RJ.MODASHIA
RJ Modashia
Project Manager

ALS Houston, US Date: 13-ago-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18111186

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18111186-01	16DRUM01-181117	Soil		17-Nov-2018 13:01	20-Nov-2018 09:20	☐
HS18111186-02	16DRUM02-181117	Soil		17-Nov-2018 13:59	20-Nov-2018 09:20	☐
HS18111186-03	16DRUM03-181117	Soil		17-Nov-2018 14:42	20-Nov-2018 09:20	☐
HS18111186-04	16DRUM04-181117	Soil		17-Nov-2018 15:38	20-Nov-2018 09:20	☐

Revision: 1

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS18111186

CASE NARRATIVE

Work Order Comments

- Manganese reported with E flag for Sample HS18111186-04 due to results marginally higher than UQL (Upper quantitation Limit)

Work Order Comments

- Revised to update the Metals select list to As, Cr, Tl, Ni and Mn

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R328402

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Metals by Method SW6020

Batch ID: 135125

Sample ID: 16DRUM01-181117 (HS18111186-01MS)

- Chromium and Manganese failed on the MS\MSD but passed on the PDS.

WetChemistry by Method ASTM D2216

Batch ID: R328545

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16DRUM01-181117
Collection Date: 17-Nov-2018 13:01

ANALYTICAL REPORT
WorkOrder:HS18111186
Lab ID:HS18111186-01
Matrix:Soil

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES BY SW8260C		**Method:SW8260**						Analyst: WLR
1,1,2-Trichloroethane	0.0015	U	0.00060	0.0015	0.0060	mg/Kg-dry	1	30-Nov-2018 13:28
1,1-Dichloroethene	0.0015	U	0.00060	0.0015	0.0060	mg/Kg-dry	1	30-Nov-2018 13:28
1,2-Dichloroethane	0.0015	U	0.00073	0.0015	0.0060	mg/Kg-dry	1	30-Nov-2018 13:28
cis-1,2-Dichloroethene	0.0015	U	0.00097	0.0015	0.0060	mg/Kg-dry	1	30-Nov-2018 13:28
Methylene chloride	0.0030	U	0.0012	0.0030	0.012	mg/Kg-dry	1	30-Nov-2018 13:28
Trichloroethene	0.0015	U	0.00073	0.0015	0.0060	mg/Kg-dry	1	30-Nov-2018 13:28
Vinyl chloride	0.0015	U	0.00097	0.0015	0.0024	mg/Kg-dry	1	30-Nov-2018 13:28
Surr: 1,2-Dichloroethane-d4	*100*			**0**	*70-126*	*%REC*	*1*	*30-Nov-2018 13:28*
Surr: 4-Bromofluorobenzene	*99.8*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:28*
Surr: Dibromofluoromethane	*100.0*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:28*
Surr: Toluene-d8	*101*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:28*
METALS BY SW6020A		**Method:SW6020**				Prep:SW3050A / 03-Dec-2018		Analyst: JCJ
Arsenic	**3.56**		**0.0826**	**0.118**	**0.590**	**mg/Kg-dry**	1	07-Dec-2018 21:04
Chromium	**12.2**		**0.0271**	**0.118**	**0.590**	**mg/Kg-dry**	1	07-Dec-2018 21:04
Manganese	**121**		**0.0507**	**0.118**	**0.590**	**mg/Kg-dry**	1	07-Dec-2018 21:04
Nickel	**11.7**		**0.0566**	**0.118**	**0.590**	**mg/Kg-dry**	1	07-Dec-2018 21:04
Thallium	0.295	U	0.263	0.295	0.590	mg/Kg-dry	1	07-Dec-2018 21:04
MOISTURE - ASTM D2216		**Method:ASTM D2216**						Analyst: DFF
Percent Moisture	**18.1**		**0.0100**	**0.0100**	**0.0100**	**wt%**	1	03-Dec-2018 10:56
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA-dry	1	10-Dec-2018 16:07

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16DRUM02-181117
Collection Date: 17-Nov-2018 13:59

ANALYTICAL REPORT
WorkOrder:HS18111186
Lab ID:HS18111186-02
Matrix:Soil

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES BY SW8260C		**Method:SW8260**						Analyst: WLR
1,1,2-Trichloroethane	0.0015	U	0.00062	0.0015	0.0062	mg/Kg-dry	1	30-Nov-2018 13:52
1,1-Dichloroethene	0.0015	U	0.00062	0.0015	0.0062	mg/Kg-dry	1	30-Nov-2018 13:52
1,2-Dichloroethane	0.0015	U	0.00074	0.0015	0.0062	mg/Kg-dry	1	30-Nov-2018 13:52
cis-1,2-Dichloroethene	0.0015	U	0.00099	0.0015	0.0062	mg/Kg-dry	1	30-Nov-2018 13:52
Methylene chloride	0.0031	U	0.0012	0.0031	0.012	mg/Kg-dry	1	30-Nov-2018 13:52
Trichloroethene	0.0015	U	0.00074	0.0015	0.0062	mg/Kg-dry	1	30-Nov-2018 13:52
Vinyl chloride	0.0015	U	0.00099	0.0015	0.0025	mg/Kg-dry	1	30-Nov-2018 13:52
Surr: 1,2-Dichloroethane-d4	*101*			**0**	*70-126*	*%REC*	*1*	*30-Nov-2018 13:52*
Surr: 4-Bromofluorobenzene	*100*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:52*
Surr: Dibromofluoromethane	*99.7*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:52*
Surr: Toluene-d8	*97.8*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 13:52*
METALS BY SW6020A		**Method:SW6020**				Prep:SW3050A / 03-Dec-2018		Analyst: JCJ
Arsenic	**1.72**		**0.0831**	**0.119**	**0.593**	**mg/Kg-dry**	1	07-Dec-2018 21:22
Chromium	**15.0**		**0.0273**	**0.119**	**0.593**	**mg/Kg-dry**	1	07-Dec-2018 21:22
Manganese	**85.2**		**0.0510**	**0.119**	**0.593**	**mg/Kg-dry**	1	07-Dec-2018 21:22
Nickel	**12.5**		**0.0570**	**0.119**	**0.593**	**mg/Kg-dry**	1	07-Dec-2018 21:22
Thallium	0.297	U	0.265	0.297	0.593	mg/Kg-dry	1	07-Dec-2018 21:22
MOISTURE - ASTM D2216		**Method:ASTM D2216**						Analyst: DFF
Percent Moisture	**20.0**		**0.0100**	**0.0100**	**0.0100**	**wt%**	1	03-Dec-2018 10:56
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA-dry	1	10-Dec-2018 16:07

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16DRUM03-181117
Collection Date: 17-Nov-2018 14:42

ANALYTICAL REPORT
WorkOrder:HS18111186
Lab ID:HS18111186-03
Matrix:Soil

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES BY SW8260C		**Method:SW8260**						Analyst: WLR
1,1,2-Trichloroethane	0.0014	U	0.00059	0.0014	0.0059	mg/Kg-dry	1	30-Nov-2018 14:17
1,1-Dichloroethene	0.0014	U	0.00059	0.0014	0.0059	mg/Kg-dry	1	30-Nov-2018 14:17
1,2-Dichloroethane	0.0014	U	0.00071	0.0014	0.0059	mg/Kg-dry	1	30-Nov-2018 14:17
cis-1,2-Dichloroethene	0.0014	U	0.00094	0.0014	0.0059	mg/Kg-dry	1	30-Nov-2018 14:17
Methylene chloride	0.0029	U	0.0012	0.0029	0.012	mg/Kg-dry	1	30-Nov-2018 14:17
Trichloroethene	0.0014	U	0.00071	0.0014	0.0059	mg/Kg-dry	1	30-Nov-2018 14:17
Vinyl chloride	0.0014	U	0.00094	0.0014	0.0024	mg/Kg-dry	1	30-Nov-2018 14:17
Surr: 1,2-Dichloroethane-d4	*101*			**0**	*70-126*	*%REC*	*1*	*30-Nov-2018 14:17*
Surr: 4-Bromofluorobenzene	*99.9*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:17*
Surr: Dibromofluoromethane	*99.6*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:17*
Surr: Toluene-d8	*104*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:17*
METALS BY SW6020A		**Method:SW6020**				Prep:SW3050A / 03-Dec-2018		Analyst: JCJ
Arsenic	**2.67**		**0.0775**	**0.111**	**0.554**	**mg/Kg-dry**	1	07-Dec-2018 21:24
Chromium	**9.18**		**0.0255**	**0.111**	**0.554**	**mg/Kg-dry**	1	07-Dec-2018 21:24
Manganese	**159**		**0.0476**	**0.111**	**0.554**	**mg/Kg-dry**	1	07-Dec-2018 21:24
Nickel	**11.0**		**0.0532**	**0.111**	**0.554**	**mg/Kg-dry**	1	07-Dec-2018 21:24
Thallium	0.277	U	0.247	0.277	0.554	mg/Kg-dry	1	07-Dec-2018 21:24
MOISTURE - ASTM D2216		**Method:ASTM D2216**						Analyst: DFF
Percent Moisture	**17.7**		**0.0100**	**0.0100**	**0.0100**	**wt%**	1	03-Dec-2018 10:56
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA-dry	1	10-Dec-2018 16:07

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16DRUM04-181117
Collection Date: 17-Nov-2018 15:38

ANALYTICAL REPORT
WorkOrder:HS18111186
Lab ID:HS18111186-04
Matrix:Soil

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES BY SW8260C		**Method:SW8260**						Analyst: WLR
1,1,2-Trichloroethane	0.0014	U	0.00058	0.0014	0.0058	mg/Kg-dry	1	30-Nov-2018 14:42
1,1-Dichloroethene	0.0014	U	0.00058	0.0014	0.0058	mg/Kg-dry	1	30-Nov-2018 14:42
1,2-Dichloroethane	0.0014	U	0.00070	0.0014	0.0058	mg/Kg-dry	1	30-Nov-2018 14:42
cis-1,2-Dichloroethene	0.0014	U	0.00093	0.0014	0.0058	mg/Kg-dry	1	30-Nov-2018 14:42
Methylene chloride	0.0029	U	0.0012	0.0029	0.012	mg/Kg-dry	1	30-Nov-2018 14:42
Trichloroethene	0.0014	U	0.00070	0.0014	0.0058	mg/Kg-dry	1	30-Nov-2018 14:42
Vinyl chloride	0.0014	U	0.00093	0.0014	0.0023	mg/Kg-dry	1	30-Nov-2018 14:42
Surr: 1,2-Dichloroethane-d4	*100*			**0**	*70-126*	*%REC*	*1*	*30-Nov-2018 14:42*
Surr: 4-Bromofluorobenzene	*100*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:42*
Surr: Dibromofluoromethane	*100*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:42*
Surr: Toluene-d8	*99.1*			**0**	*70-130*	*%REC*	*1*	*30-Nov-2018 14:42*
METALS BY SW6020A		**Method:SW6020**				Prep:SW3050A / 03-Dec-2018		Analyst: JCJ
Arsenic	**2.35**		**0.0803**	**0.115**	**0.573**	**mg/Kg-dry**	1	07-Dec-2018 21:27
Chromium	**14.9**		**0.0264**	**0.115**	**0.573**	**mg/Kg-dry**	1	07-Dec-2018 21:27
Manganese	**215**	E	**0.0493**	**0.115**	**0.573**	**mg/Kg-dry**	1	07-Dec-2018 21:27
Nickel	**10.4**		**0.0550**	**0.115**	**0.573**	**mg/Kg-dry**	1	07-Dec-2018 21:27
Thallium	0.287	U	0.256	0.287	0.573	mg/Kg-dry	1	07-Dec-2018 21:27
MOISTURE - ASTM D2216		**Method:ASTM D2216**						Analyst: DFF
Percent Moisture	**17.7**		**0.0100**	**0.0100**	**0.0100**	**wt%**	1	03-Dec-2018 10:56
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA-dry	1	10-Dec-2018 16:07

Note: See Qualifiers Page for a list of qualifiers and their explanation. **Revision:** 1

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WEIGHT LOG

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

Batch ID: 2788 **Method:** VOLATILES BY SW8260C

SampID	Container	Sample Wt/Vol	Final Volume	Weight Factor	Container Type
HS18111186-01	1	5.035 (g)	5 (mL)	0.99	Bulk (5030B)
HS18111186-02	1	5.042 (g)	5 (mL)	0.99	Bulk (5030B)
HS18111186-03	1	5.151 (g)	5 (mL)	0.97	Bulk (5030B)
HS18111186-04	1	5.216 (g)	5 (mL)	0.96	Bulk (5030B)

Batch ID: 135125 **Method:** METALS BY SW6020A **Prep:** 3050_I_LOW

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18111186-01	1	0.5174	50 (mL)	96.64
HS18111186-02	1	0.5267	50 (mL)	94.93
HS18111186-03	1	0.5486	50 (mL)	91.14
HS18111186-04	1	0.5298	50 (mL)	94.38

ALS Houston, US Date: 13-ago-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID: 135125 (0)	**Test Name :** METALS BY SW6020A				**Matrix:** Soil	
HS18111186-01	16DRUM01-181117	17 Nov 2018 13:01		03 Dec 2018 11:28	07 Dec 2018 21:04	1
HS18111186-02	16DRUM02-181117	17 Nov 2018 13:59		03 Dec 2018 11:28	07 Dec 2018 21:22	1
HS18111186-03	16DRUM03-181117	17 Nov 2018 14:42		03 Dec 2018 11:28	07 Dec 2018 21:24	1
HS18111186-04	16DRUM04-181117	17 Nov 2018 15:38		03 Dec 2018 11:28	07 Dec 2018 21:27	1
Batch ID: R328402 (0)	**Test Name :** VOLATILES BY SW8260C				**Matrix:** Soil	
HS18111186-01	16DRUM01-181117	17 Nov 2018 13:01			30 Nov 2018 13:28	1
HS18111186-02	16DRUM02-181117	17 Nov 2018 13:59			30 Nov 2018 13:52	1
HS18111186-03	16DRUM03-181117	17 Nov 2018 14:42			30 Nov 2018 14:17	1
HS18111186-04	16DRUM04-181117	17 Nov 2018 15:38			30 Nov 2018 14:42	1
Batch ID: R328545 (0)	**Test Name :** MOISTURE - ASTM D2216				**Matrix:** Soil	
HS18111186-01	16DRUM01-181117	17 Nov 2018 13:01			03 Dec 2018 10:56	1
HS18111186-02	16DRUM02-181117	17 Nov 2018 13:59			03 Dec 2018 10:56	1
HS18111186-03	16DRUM03-181117	17 Nov 2018 14:42			03 Dec 2018 10:56	1
HS18111186-04	16DRUM04-181117	17 Nov 2018 15:38			03 Dec 2018 10:56	1
Batch ID: R328913 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Soil	
HS18111186-01	16DRUM01-181117	17 Nov 2018 13:01			10 Dec 2018 16:07	1
HS18111186-02	16DRUM02-181117	17 Nov 2018 13:59			10 Dec 2018 16:07	1
HS18111186-03	16DRUM03-181117	17 Nov 2018 14:42			10 Dec 2018 16:07	1
HS18111186-04	16DRUM04-181117	17 Nov 2018 15:38			10 Dec 2018 16:07	1

Revision: 1

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

QC BATCH REPORT

Batch ID: 135125 (0) **Instrument:** ICPMS04 **Method:** METALS BY SW6020A

MBLK Sample ID: **MBLK-135125** Units: **mg/Kg** Analysis Date: **08-Dec-2018 13:31**
Client ID: Run ID: **ICPMS04_328834** SeqNo: **4854813** PrepDate: **03-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	0.100	0.500								U
Chromium	0.100	0.500								U
Manganese	0.100	0.500								U
Nickel	0.100	0.500								U
Thallium	0.250	0.500								U

LCS Sample ID: **LCS-135125** Units: **mg/Kg** Analysis Date: **07-Dec-2018 20:22**
Client ID: Run ID: **ICPMS04_328768** SeqNo: **4854471** PrepDate: **03-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	9.809	0.500	10	0	98.1	80 - 120				
Chromium	9.982	0.500	10	0	99.8	80 - 120				
Manganese	9.981	0.500	10	0	99.8	80 - 120				
Nickel	9.976	0.500	10	0	99.8	80 - 120				
Thallium	9.457	0.500	10	0	94.6	80 - 120				

MS Sample ID: **HS18111186-01MS** Units: **mg/Kg** Analysis Date: **07-Dec-2018 21:16**
Client ID: **16DRUM01-181117** Run ID: **ICPMS04_328768** SeqNo: **4854495** PrepDate: **03-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	12.34	0.481	9.628	2.913	97.9	75 - 125				
Chromium	23.52	0.481	9.628	10.02	140	75 - 125				S
Manganese	124.3	0.481	9.628	99.49	258	75 - 125				SO
Nickel	21	0.481	9.628	9.594	118	75 - 125				
Thallium	9.208	0.481	9.628	0	95.6	75 - 125				

RIGHT SOLUTIONS | RIGHT PARTNER

ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

QC BATCH REPORT

Batch ID: 135125 (0) **Instrument:** ICPMS04 **Method:** METALS BY SW6020A

MSD Sample ID: **HS18111186-01MSD** Units: **mg/Kg** Analysis Date: **07-Dec-2018 21:18**
Client ID: **16DRUM01-181117** Run ID: **ICPMS04_328768** SeqNo: **4854496** PrepDate: **03-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	11.69	0.485	9.699	2.913	90.5	75 - 125	12.34	5.38	20	
Chromium	26.33	0.485	9.699	10.02	168	75 - 125	23.52	11.3	20	S
Manganese	143.4	0.485	9.699	99.49	453	75 - 125	124.3	14.3	20	SO
Nickel	20.92	0.485	9.699	9.594	117	75 - 125	21	0.414	20	
Thallium	9.233	0.485	9.699	0	95.2	75 - 125	9.208	0.272	20	

PDS Sample ID: **HS18111186-01PDS** Units: **mg/Kg** Analysis Date: **07-Dec-2018 21:20**
Client ID: **16DRUM01-181117** Run ID: **ICPMS04_328768** SeqNo: **4854497** PrepDate: **03-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	12.24	0.483	9.664	2.913	96.5	75 - 125				
Chromium	18.68	0.483	9.664	10.02	89.7	75 - 125				
Manganese	107.9	0.483	9.664	99.49	86.8	75 - 125				O
Nickel	18.09	0.483	9.664	9.594	87.9	75 - 125				
Thallium	9.445	0.483	9.664	0	97.7	75 - 125				

SD Sample ID: **HS18111186-01SD** Units: **mg/Kg** Analysis Date: **07-Dec-2018 21:13**
Client ID: **16DRUM01-181117** Run ID: **ICPMS04_328768** SeqNo: **4854494** PrepDate: **03-Dec-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Arsenic	2.892	2.42					2.913	0.723	10	
Chromium	10.65	2.42					10.02	6.27	10	
Manganese	104.8	2.42					99.49	5.33	10	
Nickel	9.814	2.42					9.594	2.29	10	
Thallium	1.21	2.42					0	0	10	U

The following samples were analyzed in this batch: HS18111186-01 HS18111186-02 HS18111186-03 HS18111186-04

Revision: 1

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

QC BATCH REPORT

Batch ID: R328402 (0) **Instrument:** VOA5 **Method:** VOLATILES BY SW8260C

MBLK Sample ID: **VBLKS1-113018** Units: **mg/Kg** Analysis Date: **30-Nov-2018 13:03**
Client ID: Run ID: **VOA5_328402** SeqNo: **4843518** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.0012	0.0050								U
1,1-Dichloroethene	0.0012	0.0050								U
1,2-Dichloroethane	0.0012	0.0050								U
cis-1,2-Dichloroethene	0.0012	0.0050								U
Methylene chloride	0.0025	0.010								U
Trichloroethene	0.0012	0.0050								U
Vinyl chloride	0.0012	0.0020								U
Surr: 1,2-Dichloroethane-d4	*0.050*	*0*	*0.05*	*0*	*101*	*76 - 125*				
Surr: 4-Bromofluorobenzene	*0.050*	*0*	*0.05*	*0*	*99.2*	*80 - 120*				
Surr: Dibromofluoromethane	*0.050*	*0*	*0.05*	*0*	*99.7*	*80 - 119*				
Surr: Toluene-d8	*0.050*	*0*	*0.05*	*0*	*99.1*	*81 - 118*				

LCS Sample ID: **VLCSS1-113018** Units: **mg/Kg** Analysis Date: **30-Nov-2018 12:13**
Client ID: Run ID: **VOA5_328402** SeqNo: **4843517** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.053	0.0050	0.05	0	105	78 - 117				
1,1-Dichloroethene	0.053	0.0050	0.05	0	107	72 - 130				
1,2-Dichloroethane	0.055	0.0050	0.05	0	109	77 - 120				
cis-1,2-Dichloroethene	0.056	0.0050	0.05	0	112	77 - 125				
Methylene chloride	0.059	0.010	0.05	0	118	71 - 125				
Trichloroethene	0.053	0.0050	0.05	0	105	78 - 125				
Vinyl chloride	0.055	0.0020	0.05	0	109	70 - 130				
Surr: 1,2-Dichloroethane-d4	*0.050*	*0*	*0.05*	*0*	*99.2*	*76 - 125*				
Surr: 4-Bromofluorobenzene	*0.050*	*0*	*0.05*	*0*	*100*	*80 - 120*				
Surr: Dibromofluoromethane	*0.050*	*0*	*0.05*	*0*	*100*	*80 - 119*				
Surr: Toluene-d8	*0.050*	*0*	*0.05*	*0*	*101*	*81 - 118*				

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

QC BATCH REPORT

Batch ID: R328402 (0) **Instrument:** VOA5 **Method:** VOLATILES BY SW8260C

MS Sample ID: **HS18111186-01MS** Units: **mg/Kg** Analysis Date: **30-Nov-2018 15:06**
Client ID: **16DRUM01-181117** Run ID: **VOA5_328402** SeqNo: **4843774** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.043	0.0050	0.0495	0	86.4	70 - 130				
1,1-Dichloroethene	0.045	0.0050	0.0495	0	91.4	70 - 130				
1,2-Dichloroethane	0.047	0.0050	0.0495	0	94.4	70 - 130				
cis-1,2-Dichloroethene	0.045	0.0050	0.0495	0	90.6	70 - 130				
Methylene chloride	0.047	0.0099	0.0495	0	95.8	70 - 130				
Trichloroethene	0.046	0.0050	0.0495	0	93.8	70 - 130				
Vinyl chloride	0.042	0.0020	0.0495	0	84.5	70 - 130				
Surr: 1,2-Dichloroethane-d4	*0.049*	*0*	*0.0495*	*0*	*99.6*	*70 - 126*				
Surr: 4-Bromofluorobenzene	*0.050*	*0*	*0.0495*	*0*	*101*	*70 - 130*				
Surr: Dibromofluoromethane	*0.050*	*0*	*0.0495*	*0*	*100*	*70 - 130*				
Surr: Toluene-d8	*0.051*	*0*	*0.0495*	*0*	*102*	*70 - 130*				

MSD Sample ID: **HS18111186-01MSD** Units: **mg/Kg** Analysis Date: **30-Nov-2018 15:31**
Client ID: **16DRUM01-181117** Run ID: **VOA5_328402** SeqNo: **4843775** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.035	0.0049	0.049	0	71.8	70 - 130	0.04277	19.5	30	
1,1-Dichloroethene	0.040	0.0049	0.049	0	81.1	70 - 130	0.04525	13	30	
1,2-Dichloroethane	0.037	0.0049	0.049	0	75.2	70 - 130	0.04675	23.7	30	
cis-1,2-Dichloroethene	0.038	0.0049	0.049	0	77.0	70 - 130	0.04486	17.3	30	
Methylene chloride	0.039	0.0098	0.049	0	80.6	70 - 130	0.04743	18.3	30	
Trichloroethene	0.039	0.0049	0.049	0	79.2	70 - 130	0.04644	18	30	
Vinyl chloride	0.039	0.0020	0.049	0	79.0	70 - 130	0.04185	7.75	30	
Surr: 1,2-Dichloroethane-d4	*0.047*	*0*	*0.049*	*0*	*95.5*	*70 - 126*	*0.04931*	*5.24*	*30*	
Surr: 4-Bromofluorobenzene	*0.049*	*0*	*0.049*	*0*	*101*	*70 - 130*	*0.04977*	*0.924*	*30*	
Surr: Dibromofluoromethane	*0.049*	*0*	*0.049*	*0*	*100*	*70 - 130*	*0.04955*	*1.01*	*30*	
Surr: Toluene-d8	*0.050*	*0*	*0.049*	*0*	*103*	*70 - 130*	*0.05054*	*0.279*	*30*	

The following samples were analyzed in this batch: HS18111186-01 HS18111186-02 HS18111186-03 HS18111186-04

Revision: 1

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS18111186

QC BATCH REPORT

Batch ID: **R328545 (0)** **Instrument:** **Balance1** **Method:** **MOISTURE - ASTM D2216**

DUP Sample ID: **HS18120010-04DUP** Units: **wt%** Analysis Date: **03-Dec-2018 10:56**
Client ID: Run ID: **Balance1_328545** SeqNo: **4847316** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Percent Moisture	24.6	0.0100					24.6	0	20	

The following samples were analyzed in this batch: HS18111186-01 HS18111186-02 HS18111186-03 HS18111186-04

Revision: 1

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ALS Houston, US Date: 13-Aug-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS18111186**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

Unit Reported	Description
mg/Kg-dry	Milligrams per Kilogram- Dry weight corrected

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CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2019	31-Dec-2019
Oklahoma	2018-156	31-Aug-2019
Texas	TX104704231-19-23	30-Apr-2020

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ALS Houston, US Date: 13-Aug-19

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS18111186

Date/Time Received: **20-Nov-2018 09:20**
Received by: **RPG**

Checklist completed by: *Paresh M. Giga* (eSignature) 21-Nov-2018 (Date)

Reviewed by: *RJ Modashia* (eSignature) 27-Nov-2018 (Date)

Matrices: **Soil**

Carrier name: **FedEx**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	1 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:37-NOV2018-GW-ALSHT-181119
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.7c/2.1c U/c	IR11
Cooler(s)/Kit(s):	24812	
Date/Time sample(s) sent to storage:	11/20/18 20:00	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

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APTIM

COC ID:	LHAAP16-2018-ALSHT-181117	TURNAROUND TIME: normal	RUSH:	Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories			Email Invoice To	FedInvoices@Aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-16			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	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	FED EX		

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	Select VOCs by 8260	Perchlorate by 6850	Select Metals by 6020							
16DRUM01-181117	LHAAP 16				SO	11/17/2018	1301	3		1	1	1							
16DRUM02-181117	LHAAP 16				SO	11/17/2018	1359	3		1	1	1							
16DRUM03-181117	LHAAP 16				SO	11/17/2018	1442	3		1	1	1							
16DRUM04-181117	LHAAP 16				SO	11/17/2018	1538	3		1	1	1							

HS18111186

Aptim Environmental & Infrastucture, Inc.

Longhorn Army Ammunition Plant

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible] APTIM	11/19/18 1150	R Gage ALS HS	11/20/18 08:20
Select Metals list: Chromium, Arsenic, Thallium, Nickel, and Manganese			cooler # 24812	
			IR # 11 cf + 0.4c	
			Temp 1.7c	

CUSTODY SEAL SM 11/20/18
DATE: 11-19-18
Signature:
24812 LHA AP

24812 NOV 2 0 2018

CUSTODY SEAL SM 11/20/18
DATE: 11-19-18
Signature:
24812 LHAAP

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP-37-BO 61933-RJ
24812
RMA:

FedEx Express

FedEx
TRK# 0221 4380 9534 1106
TUE - 20 NOV 10:30A
PRIORITY OVERNIGHT

AB SGRA
77099
TX-US IAH

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

CUSTODY SEAL
Date: 11-19-18 Time: 1700
Name:
Company:

Seal Broken By: SM
Date: 11/20/18

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Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1833151

Client: ALS Laboratories (Houston, TX)
Matrix: Soil
ELMS Batch (HBN): 2177 (228801)

General Set Information: There were four field samples in this Work Order. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 1.00 to 1.20 g aliquot of each sample was combined with 9.95mL of ASTM Type II water. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, sonicated for at least 15 minutes and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe Filters. If necessary, the samples were centrifuged at 2700rpm for 15 minutes prior to filtering in order to remove excess particulates from the extract.

Holding Times: Holding times were met for all analyses.

Dilutions: NA

Method QC data: The method blank (631026) was less than 1/2 the CRDL. The recovery for the LCS (631027) was within acceptable parameters.

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MS/MSD Analysis: A Matrix Spike and Duplicate (MS/MSD) was performed on sample 1833151001 (Client ID: 16DRUM01-181117). The Matrix Spike/Duplicate passed QC acceptance criteria for percent recoveries and relative percent difference (RPD).

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): None were required for this set.

Sample Calculation: Samples were reported in µg/Kg. Results were calculated in µg/Kg by the equation (A)x(B)x(C)x(D),

where: A = Analyte concentration from the standard curve (µg/L)
B = Conversion factor from µg/L to µg/kg (10mL/1.0g)
C = Dilution performed at time of analysis
D = Moisture correction

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1, Table F-12.

Thomas Bosch	December 10, 2018
Analyst	Date

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ANALYTICAL REPORT

Report Date: December 10, 2018

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1833151**
Project ID: HS18111186
Purchase Order: HS18111186
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16DRUM01-181117	1833151001	11/17/18	11/27/18	
16DRUM02-181117	1833151002	11/17/18	11/27/18	
16DRUM03-181117	1833151003	11/17/18	11/27/18	
16DRUM04-181117	1833151004	11/17/18	11/27/18	

ANALYTICAL REPORT

Workorder: 34-1833151
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16DRUM01-181117** | Sampling Site: NA | Collected: 11/17/2018
Lab ID: 1833151001 | Media: 4 oz Amber Glass Jar | Received: 11/27/2018
Matrix: Soil/Solid/Sediment | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Soil
Batch: ELMS/2177 (HBN: 228801)
Analyzed: 12/06/2018 10:29
Instrument ID: LCMS04
Percent Solid: 82
Report Basis: Dry

Analyte	Result (ug/Kg)	DL (ug/Kg)	LOD (ug/Kg)	LOQ (ug/Kg)	Dilution	Qual
Perchlorate	ND	12	12	24	1	U

Sample ID: **16DRUM02-181117** | Sampling Site: NA | Collected: 11/17/2018
Lab ID: 1833151002 | Media: 4 oz Amber Glass Jar | Received: 11/27/2018
Matrix: Soil/Solid/Sediment | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Soil
Batch: ELMS/2177 (HBN: 228801)
Analyzed: 12/06/2018 11:10
Instrument ID: LCMS04
Percent Solid: 81.2
Report Basis: Dry

Analyte	Result (ug/Kg)	DL (ug/Kg)	LOD (ug/Kg)	LOQ (ug/Kg)	Dilution	Qual
Perchlorate	16	12	12	25	1	J

Sample ID: **16DRUM03-181117** | Sampling Site: NA | Collected: 11/17/2018
Lab ID: 1833151003 | Media: 4 oz Amber Glass Jar | Received: 11/27/2018
Matrix: Soil/Solid/Sediment | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Soil
Batch: ELMS/2177 (HBN: 228801)
Analyzed: 12/06/2018 11:24
Instrument ID: LCMS04
Percent Solid: 81.7
Report Basis: Dry

Analyte	Result (ug/Kg)	DL (ug/Kg)	LOD (ug/Kg)	LOQ (ug/Kg)	Dilution	Qual
Perchlorate	ND	12	12	24	1	U

Sample ID: **16DRUM04-181117** | Sampling Site: NA | Collected: 11/17/2018
Lab ID: 1833151004 | Media: 4 oz Amber Glass Jar | Received: 11/27/2018
Matrix: Soil/Solid/Sediment | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Soil
Batch: ELMS/2177 (HBN: 228801)
Analyzed: 12/06/2018 11:38
Instrument ID: LCMS04
Percent Solid: 80.9
Report Basis: Dry

Analyte	Result (ug/Kg)	DL (ug/Kg)	LOD (ug/Kg)	LOQ (ug/Kg)	Dilution	Qual
Perchlorate	ND	12	12	25	1	U

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ANALYTICAL REPORT

Workorder: 34-1833151
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 12/06/2018 14:17	/S/ Stephen Brose 12/10/2018 11:53
Solids/Moisture Determination	/S/ Ilse J. Ovalle 11/30/2018 11:33	/S/ Jeff Ward 12/03/2018 11:58

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body	Certificate Number	Website
Environmental	PJLA (DoD ELAP)		
	Utah (TNI)		
	Nevada		
	Oklahoma		
	Iowa		

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ANALYTICAL REPORT

Workorder: 34-1833151
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< This testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1833151

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2177 (HBN: 228801)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Blank

LMB: 631026
Analyzed: 12/06/2018 09:59
Units: ug/Kg

Analyte	Result	MDL	RL
Perchlorate	ND	10	10.0

Laboratory Control Sample

LCS: 631027
Analyzed: 12/06/2018 10:13
Dilution: 1
Units: ug/Kg

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	46.6	50.0	93.2	84.0	121.0

Matrix Spike - Matrix Spike Duplicate

Sample:	1833151001	**MS:**	631028				**MSD:**	631029			
Analyzed:	12/06/2018 10:29	**Analyzed:**	12/06/2018 10:43				**Analyzed:**	12/06/2018 10:57			
Dilution:	1	**Dilution:**	1				**Dilution:**	1			
Units:	ug/Kg	**Units:**	ug/Kg				**Units:**	ug/Kg			
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	52.9	50	106	78.8	123.8	53.9	108	2.02	0.0	20.0

Continuing Calibration Verification

CCV:	631023			**CCV:**	631030	
Analyzed:	12/06/2018 09:17			**Analyzed:**	12/06/2018 11:53	
Units:	ug/L			**Units:**	ug/L	
Criteria:	± 15%			**Criteria:**	± 15%	
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	25.1	25.0	100	25.2	25.0	101

Interference Check Sample

ICSA: 631025
Analyzed: 12/06/2018 09:45
Units: ug/L
Criteria: ± 30%

Analyte	Result	Target	% Rec.
Perchlorate	1.10	1.00	110

Limit of Detection Verification

LODV:	631024			**LODV:**	631031	
Analyzed:	12/06/2018 09:32			**Analyzed:**	12/06/2018 12:07	
Units:	ug/L			**Units:**	ug/L	
Criteria:	± 50%			**Criteria:**	± 50%	
Analyte	**Result**	**Target**	**% Rec.**	**Result**	**Target**	**% Rec.**
Perchlorate	1.04	1.00	104	1.06	1.00	106

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Quality Control Sample
Batch Report

Analysis Information

Workorder: **1833151**

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2177 (HBN: 228801)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
12/06/2018 14:17	12/10/2018 11:53

Symbols and Definitions

- * - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ● - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

RIGHT SOLUTIONS | RIGHT PARTNER

W 1833151

10450 Stancliff Rd, Ste 210
Houston, TX 77099
T: +1 281 530 5656
F: +1 281 530 5887
www.alsglobal.com

18698/#2

Subcontract Chain of Custody

COC ID: 10285

1833151

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:
Email:

INVOICE INFORMATION:

Company: ALS Houston
Contact: Accounts Payable
Address: 10450 Stancliff Rd, Ste 210
Phone: +1 281 530 5656
Reference: HS18111186
TSR: Sonia West

	LAB SAMPLE ID / ANALYSIS REQUESTED	CLIENT SAMPLE ID	MATRIX	COLLECT DATE / DUE DATE
1.	**HS18111186-01**	**16DRUM01-181117**	**Soil**	**17 Nov 2018 13:01**
	SUB_Perch-6850			06 Dec 2018
2.	**HS18111186-02**	**16DRUM02-181117**	**Soil**	**17 Nov 2018 13:59**
	SUB_Perch-6850			06 Dec 2018
3.	**HS18111186-03**	**16DRUM03-181117**	**Soil**	**17 Nov 2018 14:42**
	SUB_Perch-6850			06 Dec 2018
4.	**HS18111186-04**	**16DRUM04-181117**	**Soil**	**17 Nov 2018 15:38**
	SUB_Perch-6850			06 Dec 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: R Cage — Date/Time: 11/26/18 1800

Received By: Taylor Coates — Date/Time: 11/27/18 10:10

Cooler ID(s): — Temperature(s):

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ALS-SALT LAKE CITY-RELATED INFORMATION REPORT (CRIR)

1833151

COOLER OR CONTAINER INFORMATION CHECKLIST (Fill In or Circle)

Client Name: ALS HOUSTON

Project/Task/Site: HS18111186

Date/Time of Receipt: 11 27 18 10:10

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:							
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C18 8966	1 °C	4	C18	°C	7	C18	°C
2	C18	°C	5	C18	°C	8	C18	°C
3	C18	°C	6	C18	°C	9	C18	°C

Taken By: Gayleen Coates (Signature) GAYLEEN COATES (Printed Name) 11 27 18 (Date)

CLIENT-RELATED INFORMATION

☐ Missing Cooler	☐ Missing Samples/Bottles	☐ Incorrect Preservation	☐ Insufficient Sample Volume
☐ Cooler Conditions	☐ Broken/Leaking Samples	☐ pH Criteria Not Met	☐ Chain of Custody Problems
☐ Missing Paperwork	☐ Incorrect Bottle Type	☐ Residual Chlorine Present	☐ Other:
☐ Missing/Incorrect Bottle Labels	☐ Cooler Temperatures Out of Range	☐ Head Space in Bottles	

BRIEFLY DESCRIBE THE PROBLEM AND THE ACTION TAKEN:

Client Notified? YES ☐ NO ☐

Response Required Within 24 Hours

PROJECT MANAGEMENT

PROJECT MANAGER COMMENTS:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc Revised 01/01/2018

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TUE – 27 NOV

TRK# 0201 4380 9534 9390

STANDARD OVERNIGHT

AX BTFA

84123

UT–US SLC

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ALS Environmental
CHAIN-OF-CUSTODY

Project / Job / Task: HS18111186 | **Split:** | **Workorder ID:** 1833151 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 4ozAGWM

Comments:

Preservatives: COOL

Containers: ID(s) / Count

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	ID(s)	Count	EPA 6850, DoD QSM											
1	11/17/2018 13:01	16DRUM01-181117	1833151001		Soil/Solid/Sediment	A	1	A		1.070		1.047		1.022					
2	11/17/2018 13:59	16DRUM02-181117	1833151002		Soil/Solid/Sediment	A	1	A			1.086								
3	11/17/2018 14:42	16DRUM03-181117	1833151003		Soil/Solid/Sediment	A	1	A			1.012								
4	11/17/2018 15:38	16DRUM04-181117	1833151004		Soil/Solid/Sediment	A	1	A			1.050								
5																			
6																			
7																			
8																			
9																			
10																			

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	11/27/2018 10:10	ALS Sample Receiving	Sample Login
Julie Warath	11/27/18 1400	6B	storage
R_33_1 6B IJO	11/29/18 11:15	Alex & Orville	To soil
Alex & Orville	11/29/18 16:30	R_33_1 6B IJO	storage
R.33.1	12-5-18/08:00	T. Bash	6850

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

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Batch Worklist

Batch: ELMS/ 2177 Created: 12/6/2018 07:46 Instrument: HBN: 228801

Rule: EPA 6850, DoD QSM Soil Analyst: T. Bosch Status: WP

Workorder: 1833151 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	631023	CCV for HBN 228801 [ELMS/2177]				CCV	3		E685041C4Q	5311		12/11/2018	
2	631024	LODV for HBN 228801 [ELMS/2177				LODV	3		E6850..D4Q	5311		12/11/2018	
3	631025	ICS for HBN 228801 [ELMS/2177]				ICS	3		E6850..D4Q	5311		12/11/2018	
4	631026	LMB for HBN 228801 [ELMS/2177]				LMB	4		E6850Q414Q	5311		12/11/2018	
5	631027	LCS for HBN 228801 [ELMS/2177]				LCS	4		E6850Q414Q	5311		12/11/2018	
6	1833151001	16DRUM01-181117				SAMPLE	4	1833151001-A	E6850Q41.4	5480	12/15/2018	12/11/2018	
7	631028	16DRUM01-181117(1833151001MS)				MS	4		E6850Q414Q	5311		12/11/2018	
8	631029	16DRUM01-181117(1833151001MSD)				MSD	4		E6850Q414Q	5311		12/11/2018	
9	1833151002	16DRUM02-181117				SAMPLE	4	1833151002-A	E6850Q41.4	5480	12/15/2018	12/11/2018	
10	1833151003	16DRUM03-181117				SAMPLE	4	1833151003-A	E6850Q41.4	5480	12/15/2018	12/11/2018	
11	1833151004	16DRUM04-181117				SAMPLE	4	1833151004-A	E6850Q41.4	5480	12/15/2018	12/11/2018	
12	631030	CCV for HBN 228801 [ELMS/2177]				CCV	3		E685041C4Q	5311		12/11/2018	
13	631031	LODV for HBN 228801 [ELMS/2177				LODV	3		E6850..D4Q	5311		12/11/2018	

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HS19090860 Longhorn Army Ammunition Plant
Cover Page

ALS WO# HS19090860

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HS19090860 8260

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WorkOrder: HS19090860

Longhorn Army Ammunition Plant

Aptim Environmental & Infrastucture, Inc.

Susan Huang
2500 City West Blvd., Suite 1700
Houston TX 77042

14-Oct-2019

HS19090860 Longhorn Army Ammunition Plant
Final

ALS WO# HS19090860

10450 Stancliff Rd. Suite 210
Houston, TX 77099
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October 02, 2019

Susan Huang
Aptim Environmental & Infrastucture, Inc.
2500 City West Blvd., Suite 1700
Houston, TX 77042

Work Order: **HS19090860**

Laboratory Results for: **Longhorn Army Ammunition Plant**

Dear Susan,

ALS Environmental received 16 sample(s) on Sep 18, 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: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS19090860

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS19090860-01	16WW14-190916	Water		16-Sep-2019 13:43	18-Sep-2019 09:00	☐
HS19090860-02	16WW16-190916	Water		16-Sep-2019 14:34	18-Sep-2019 09:00	☐
HS19090860-03	16WW36-190916	Water		16-Sep-2019 15:37	18-Sep-2019 09:00	☐
HS19090860-04	16WW42-190916	Water		16-Sep-2019 16:33	18-Sep-2019 09:00	☐
HS19090860-05	16WW22-190917	Water		17-Sep-2019 09:37	18-Sep-2019 09:00	☐
HS19090860-06	16WW41-190917	Water		17-Sep-2019 10:35	18-Sep-2019 09:00	☐
HS19090860-07	16WW39-190917	Water		17-Sep-2019 11:43	18-Sep-2019 09:00	☐
HS19090860-08	16WW56-190917	Water		17-Sep-2019 13:12	18-Sep-2019 09:00	☐
HS19090860-09	16WW40-190917	Water		17-Sep-2019 14:09	18-Sep-2019 09:00	☐
HS19090860-10	16WW55-190917	Water		17-Sep-2019 14:54	18-Sep-2019 09:00	☐
HS19090860-11	16WW43-190917	Water		17-Sep-2019 12:35	18-Sep-2019 09:00	☐
HS19090860-12	16WW23-190917	Water		17-Sep-2019 13:50	18-Sep-2019 09:00	☐
HS19090860-13	16WW24-190917	Water		17-Sep-2019 14:55	18-Sep-2019 09:00	☐
HS19090860-14	16WW27-190917	Water		17-Sep-2019 10:25	18-Sep-2019 09:00	☐
HS19090860-15	16LHAAP-TB1-190916	Water	C&G-080519-513	16-Sep-2019 00:00	18-Sep-2019 09:00	☐
HS19090860-16	16LHAAP-TB2-190916	Water	C&G-080519-516	16-Sep-2019 00:00	18-Sep-2019 09:00	☐

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Work Order: HS19090860

CASE NARRATIVE

Work Order Comments

- The analysis for Perchlorate was subcontracted to ALS Salt Lake City, UT. Final report attached.

GCMS Volatiles by Method SW8260

Batch ID: R346918,R347016,R347098

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW14-190916	Lab ID:HS19090860-01
Collection Date:	16-Sep-2019 13:43	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	24-Sep-2019 18:47
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 18:47
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 18:47
cis-1,2-Dichloroethene	**0.79**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 18:47
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	24-Sep-2019 18:47
Trichloroethene	**25**		**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 18:47
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 18:47
Surr: 1,2-Dichloroethane-d4	*91.2*			**0**	*81-118*	*%REC*	*1*	*24-Sep-2019 18:47*
Surr: 4-Bromofluorobenzene	*103*			**0**	*85-114*	*%REC*	*1*	*24-Sep-2019 18:47*
Surr: Dibromofluoromethane	*94.4*			**0**	*80-119*	*%REC*	*1*	*24-Sep-2019 18:47*
Surr: Toluene-d8	*97.7*			**0**	*89-112*	*%REC*	*1*	*24-Sep-2019 18:47*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW16-190916
Collection Date: 16-Sep-2019 14:34

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-02
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	12	U	7.5	12	25	UG/L	25	24-Sep-2019 19:11
1,1-Dichloroethene	**25**	J	**5.0**	**12**	**25**	**UG/L**	25	24-Sep-2019 19:11
1,2-Dichloroethane	**19**	J	**5.0**	**12**	**25**	**UG/L**	25	24-Sep-2019 19:11
cis-1,2-Dichloroethene	**6,600**		**50**	**120**	**250**	**UG/L**	250	24-Sep-2019 20:23
Methylene chloride	25	U	10	25	50	UG/L	25	24-Sep-2019 19:11
Trichloroethene	**13,000**		**50**	**120**	**250**	**UG/L**	250	24-Sep-2019 20:23
Vinyl chloride	**220**		**5.0**	**12**	**25**	**UG/L**	25	24-Sep-2019 19:11
Surr: 1,2-Dichloroethane-d4	*91.5*			**0**	*81-118*	*%REC*	*25*	*24-Sep-2019 19:11*
Surr: 1,2-Dichloroethane-d4	*92.0*			**0**	*81-118*	*%REC*	*250*	*24-Sep-2019 20:23*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*25*	*24-Sep-2019 19:11*
Surr: 4-Bromofluorobenzene	*105*			**0**	*85-114*	*%REC*	*250*	*24-Sep-2019 20:23*
Surr: Dibromofluoromethane	*93.6*			**0**	*80-119*	*%REC*	*25*	*24-Sep-2019 19:11*
Surr: Dibromofluoromethane	*94.3*			**0**	*80-119*	*%REC*	*250*	*24-Sep-2019 20:23*
Surr: Toluene-d8	*97.4*			**0**	*89-112*	*%REC*	*25*	*24-Sep-2019 19:11*
Surr: Toluene-d8	*101*			**0**	*89-112*	*%REC*	*250*	*24-Sep-2019 20:23*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW36-190916
Collection Date: 16-Sep-2019 15:37

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-03
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	12	U	7.5	12	25	UG/L	25	25-Sep-2019 15:02
1,1-Dichloroethene	**190**		**5.0**	**12**	**25**	**UG/L**	25	25-Sep-2019 15:02
1,2-Dichloroethane	**13**	J	**5.0**	**12**	**25**	**UG/L**	25	25-Sep-2019 15:02
cis-1,2-Dichloroethene	**19,000**		**50**	**120**	**250**	**UG/L**	250	25-Sep-2019 16:14
Methylene chloride	25	U	10	25	50	UG/L	25	25-Sep-2019 15:02
Trichloroethene	**15,000**		**50**	**120**	**250**	**UG/L**	250	25-Sep-2019 16:14
Vinyl chloride	**230**		**5.0**	**12**	**25**	**UG/L**	25	25-Sep-2019 15:02
Surr: 1,2-Dichloroethane-d4	*91.9*			**0**	*81-118*	*%REC*	*25*	*25-Sep-2019 15:02*
Surr: 1,2-Dichloroethane-d4	*91.0*			**0**	*81-118*	*%REC*	*250*	*25-Sep-2019 16:14*
Surr: 4-Bromofluorobenzene	*106*			**0**	*85-114*	*%REC*	*25*	*25-Sep-2019 15:02*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*250*	*25-Sep-2019 16:14*
Surr: Dibromofluoromethane	*94.2*			**0**	*80-119*	*%REC*	*25*	*25-Sep-2019 15:02*
Surr: Dibromofluoromethane	*93.8*			**0**	*80-119*	*%REC*	*250*	*25-Sep-2019 16:14*
Surr: Toluene-d8	*96.6*			**0**	*89-112*	*%REC*	*25*	*25-Sep-2019 15:02*
Surr: Toluene-d8	*98.9*			**0**	*89-112*	*%REC*	*250*	*25-Sep-2019 16:14*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW42-190916
Collection Date: 16-Sep-2019 16:33

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-04
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	25-Sep-2019 14:37
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:37
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:37
cis-1,2-Dichloroethene	**240**		**1.0**	**2.5**	**5.0**	**UG/L**	5	25-Sep-2019 16:38
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	25-Sep-2019 14:37
Trichloroethene	**29**		**0.20**	**0.50**	**1.0**	**UG/L**	1	25-Sep-2019 14:37
Vinyl chloride	**1.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	25-Sep-2019 14:37
Surr: 1,2-Dichloroethane-d4	*90.6*			**0**	*81-118*	*%REC*	*5*	*25-Sep-2019 16:38*
Surr: 1,2-Dichloroethane-d4	*91.2*			**0**	*81-118*	*%REC*	*1*	*25-Sep-2019 14:37*
Surr: 4-Bromofluorobenzene	*105*			**0**	*85-114*	*%REC*	*1*	*25-Sep-2019 14:37*
Surr: 4-Bromofluorobenzene	*108*			**0**	*85-114*	*%REC*	*5*	*25-Sep-2019 16:38*
Surr: Dibromofluoromethane	*94.2*			**0**	*80-119*	*%REC*	*1*	*25-Sep-2019 14:37*
Surr: Dibromofluoromethane	*93.8*			**0**	*80-119*	*%REC*	*5*	*25-Sep-2019 16:38*
Surr: Toluene-d8	*97.6*			**0**	*89-112*	*%REC*	*5*	*25-Sep-2019 16:38*
Surr: Toluene-d8	*98.9*			**0**	*89-112*	*%REC*	*1*	*25-Sep-2019 14:37*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW22-190917	Lab ID:HS19090860-05
Collection Date:	17-Sep-2019 09:37	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	24-Sep-2019 20:47
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 20:47
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 20:47
cis-1,2-Dichloroethene	**2.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 20:47
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	24-Sep-2019 20:47
Trichloroethene	**34**		**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 20:47
Vinyl chloride	**0.44**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 20:47
Surr: 1,2-Dichloroethane-d4	*91.4*			**0**	*81-118*	*%REC*	*1*	*24-Sep-2019 20:47*
Surr: 4-Bromofluorobenzene	*106*			**0**	*85-114*	*%REC*	*1*	*24-Sep-2019 20:47*
Surr: Dibromofluoromethane	*94.0*			**0**	*80-119*	*%REC*	*1*	*24-Sep-2019 20:47*
Surr: Toluene-d8	*98.8*			**0**	*89-112*	*%REC*	*1*	*24-Sep-2019 20:47*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW41-190917
Collection Date: 17-Sep-2019 10:35

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-06
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	UG/L	10	25-Sep-2019 19:26
1,1-Dichloroethene	**11**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 19:26
1,2-Dichloroethane	5.0	U	2.0	5.0	10	UG/L	10	25-Sep-2019 19:26
cis-1,2-Dichloroethene	**1,300**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 19:26
Methylene chloride	10	U	4.0	10	20	UG/L	10	25-Sep-2019 19:26
Trichloroethene	**3,900**		**20**	**50**	**100**	**UG/L**	100	25-Sep-2019 19:50
Vinyl chloride	**80**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 19:26
Surr: 1,2-Dichloroethane-d4	*89.6*			**0**	*81-118*	*%REC*	*10*	*25-Sep-2019 19:26*
Surr: 1,2-Dichloroethane-d4	*90.1*			**0**	*81-118*	*%REC*	*100*	*25-Sep-2019 19:50*
Surr: 4-Bromofluorobenzene	*105*			**0**	*85-114*	*%REC*	*10*	*25-Sep-2019 19:26*
Surr: 4-Bromofluorobenzene	*105*			**0**	*85-114*	*%REC*	*100*	*25-Sep-2019 19:50*
Surr: Dibromofluoromethane	*93.3*			**0**	*80-119*	*%REC*	*10*	*25-Sep-2019 19:26*
Surr: Dibromofluoromethane	*94.0*			**0**	*80-119*	*%REC*	*100*	*25-Sep-2019 19:50*
Surr: Toluene-d8	*98.7*			**0**	*89-112*	*%REC*	*10*	*25-Sep-2019 19:26*
Surr: Toluene-d8	*98.2*			**0**	*89-112*	*%REC*	*100*	*25-Sep-2019 19:50*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW39-190917
Collection Date: 17-Sep-2019 11:43

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-07
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	27-Sep-2019 00:50
1,1-Dichloroethene	**2.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:50
1,2-Dichloroethane	**2.0**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:50
cis-1,2-Dichloroethene	**110**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:50
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	27-Sep-2019 00:50
Trichloroethene	**1,200**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 20:14
Vinyl chloride	**7.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:50
Surr: 1,2-Dichloroethane-d4	*89.4*			**0**	*81-118*	*%REC*	*10*	*25-Sep-2019 20:14*
Surr: 1,2-Dichloroethane-d4	*85.4*			**0**	*81-118*	*%REC*	*1*	*27-Sep-2019 00:50*
Surr: 4-Bromofluorobenzene	*102*			**0**	*85-114*	*%REC*	*10*	*25-Sep-2019 20:14*
Surr: 4-Bromofluorobenzene	*102*			**0**	*85-114*	*%REC*	*1*	*27-Sep-2019 00:50*
Surr: Dibromofluoromethane	*91.7*			**0**	*80-119*	*%REC*	*10*	*25-Sep-2019 20:14*
Surr: Dibromofluoromethane	*89.4*			**0**	*80-119*	*%REC*	*1*	*27-Sep-2019 00:50*
Surr: Toluene-d8	*99.5*			**0**	*89-112*	*%REC*	*10*	*25-Sep-2019 20:14*
Surr: Toluene-d8	*96.7*			**0**	*89-112*	*%REC*	*1*	*27-Sep-2019 00:50*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW56-190917	Lab ID:HS19090860-08
Collection Date:	17-Sep-2019 13:12	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	24-Sep-2019 21:11
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:11
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:11
cis-1,2-Dichloroethene	**1.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 21:11
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	24-Sep-2019 21:11
Trichloroethene	**27**		**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 21:11
Vinyl chloride	**0.41**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	24-Sep-2019 21:11
Surr: 1,2-Dichloroethane-d4	*92.1*			**0**	*81-118*	*%REC*	*1*	*24-Sep-2019 21:11*
Surr: 4-Bromofluorobenzene	*106*			**0**	*85-114*	*%REC*	*1*	*24-Sep-2019 21:11*
Surr: Dibromofluoromethane	*95.1*			**0**	*80-119*	*%REC*	*1*	*24-Sep-2019 21:11*
Surr: Toluene-d8	*98.4*			**0**	*89-112*	*%REC*	*1*	*24-Sep-2019 21:11*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16WW40-190917
Collection Date: 17-Sep-2019 14:09

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-09
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	27-Sep-2019 00:26
1,1-Dichloroethene	**3.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:26
1,2-Dichloroethane	**3.8**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:26
cis-1,2-Dichloroethene	**130**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:26
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	27-Sep-2019 00:26
Trichloroethene	**740**		**1.0**	**2.5**	**5.0**	**UG/L**	5	25-Sep-2019 18:38
Vinyl chloride	**3.0**		**0.20**	**0.50**	**1.0**	**UG/L**	1	27-Sep-2019 00:26
Surr: 1,2-Dichloroethane-d4	*90.3*			**0**	*81-118*	*%REC*	*5*	*25-Sep-2019 18:38*
Surr: 1,2-Dichloroethane-d4	*85.5*			**0**	*81-118*	*%REC*	*1*	*27-Sep-2019 00:26*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*5*	*25-Sep-2019 18:38*
Surr: 4-Bromofluorobenzene	*106*			**0**	*85-114*	*%REC*	*1*	*27-Sep-2019 00:26*
Surr: Dibromofluoromethane	*92.7*			**0**	*80-119*	*%REC*	*5*	*25-Sep-2019 18:38*
Surr: Dibromofluoromethane	*91.3*			**0**	*80-119*	*%REC*	*1*	*27-Sep-2019 00:26*
Surr: Toluene-d8	*98.8*			**0**	*89-112*	*%REC*	*5*	*25-Sep-2019 18:38*
Surr: Toluene-d8	*96.7*			**0**	*89-112*	*%REC*	*1*	*27-Sep-2019 00:26*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW55-190917	Lab ID:HS19090860-10
Collection Date:	17-Sep-2019 14:54	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	5.0	U	3.0	5.0	10	UG/L	10	25-Sep-2019 21:02
1,1-Dichloroethene	**9.1**	J	**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 21:02
1,2-Dichloroethane	**5.3**	J	**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 21:02
cis-1,2-Dichloroethene	**310**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 21:02
Methylene chloride	10	U	4.0	10	20	UG/L	10	25-Sep-2019 21:02
Trichloroethene	**3,200**		**20**	**50**	**100**	**UG/L**	100	25-Sep-2019 21:26
Vinyl chloride	**37**		**2.0**	**5.0**	**10**	**UG/L**	10	25-Sep-2019 21:02
Surr: 1,2-Dichloroethane-d4	*90.0*			**0**	*81-118*	*%REC*	*10*	*25-Sep-2019 21:02*
Surr: 1,2-Dichloroethane-d4	*89.0*			**0**	*81-118*	*%REC*	*100*	*25-Sep-2019 21:26*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*10*	*25-Sep-2019 21:02*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*100*	*25-Sep-2019 21:26*
Surr: Dibromofluoromethane	*93.5*			**0**	*80-119*	*%REC*	*10*	*25-Sep-2019 21:02*
Surr: Dibromofluoromethane	*93.3*			**0**	*80-119*	*%REC*	*100*	*25-Sep-2019 21:26*
Surr: Toluene-d8	*99.9*			**0**	*89-112*	*%REC*	*10*	*25-Sep-2019 21:02*
Surr: Toluene-d8	*98.4*			**0**	*89-112*	*%REC*	*100*	*25-Sep-2019 21:26*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW43-190917	Lab ID:HS19090860-11
Collection Date:	17-Sep-2019 12:35	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	24-Sep-2019 21:36
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:36
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:36
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:36
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	24-Sep-2019 21:36
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:36
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 21:36
Surr: 1,2-Dichloroethane-d4	*91.2*			**0**	*81-118*	*%REC*	*1*	*24-Sep-2019 21:36*
Surr: 4-Bromofluorobenzene	*103*			**0**	*85-114*	*%REC*	*1*	*24-Sep-2019 21:36*
Surr: Dibromofluoromethane	*94.3*			**0**	*80-119*	*%REC*	*1*	*24-Sep-2019 21:36*
Surr: Toluene-d8	*99.3*			**0**	*89-112*	*%REC*	*1*	*24-Sep-2019 21:36*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW23-190917	Lab ID:HS19090860-12
Collection Date:	17-Sep-2019 13:50	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	24-Sep-2019 22:00
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 22:00
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 22:00
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 22:00
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	24-Sep-2019 22:00
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 22:00
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	24-Sep-2019 22:00
Surr: 1,2-Dichloroethane-d4	*91.5*			**0**	*81-118*	*%REC*	*1*	*24-Sep-2019 22:00*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*1*	*24-Sep-2019 22:00*
Surr: Dibromofluoromethane	*94.4*			**0**	*80-119*	*%REC*	*1*	*24-Sep-2019 22:00*
Surr: Toluene-d8	*98.3*			**0**	*89-112*	*%REC*	*1*	*24-Sep-2019 22:00*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW24-190917	Lab ID:HS19090860-13
Collection Date:	17-Sep-2019 14:55	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	25-Sep-2019 17:02
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:02
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:02
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:02
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	25-Sep-2019 17:02
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:02
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:02
Surr: 1,2-Dichloroethane-d4	*90.7*			**0**	*81-118*	*%REC*	*1*	*25-Sep-2019 17:02*
Surr: 4-Bromofluorobenzene	*102*			**0**	*85-114*	*%REC*	*1*	*25-Sep-2019 17:02*
Surr: Dibromofluoromethane	*93.0*			**0**	*80-119*	*%REC*	*1*	*25-Sep-2019 17:02*
Surr: Toluene-d8	*99.5*			**0**	*89-112*	*%REC*	*1*	*25-Sep-2019 17:02*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client:	Aptim Environmental & Infrastucture, Inc.	**ANALYTICAL REPORT**
Project:	Longhorn Army Ammunition Plant	WorkOrder:HS19090860
Sample ID:	16WW27-190917	Lab ID:HS19090860-14
Collection Date:	17-Sep-2019 10:25	Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	25-Sep-2019 17:26
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:26
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:26
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:26
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	25-Sep-2019 17:26
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:26
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 17:26
Surr: 1,2-Dichloroethane-d4	*90.6*			**0**	*81-118*	*%REC*	*1*	*25-Sep-2019 17:26*
Surr: 4-Bromofluorobenzene	*105*			**0**	*85-114*	*%REC*	*1*	*25-Sep-2019 17:26*
Surr: Dibromofluoromethane	*92.9*			**0**	*80-119*	*%REC*	*1*	*25-Sep-2019 17:26*
Surr: Toluene-d8	*99.8*			**0**	*89-112*	*%REC*	*1*	*25-Sep-2019 17:26*
SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	02-Oct-2019 16:54

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16LHAAP-TB1-190916
Collection Date: 16-Sep-2019 00:00

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-15
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	25-Sep-2019 13:49
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 13:49
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 13:49
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 13:49
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	25-Sep-2019 13:49
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 13:49
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 13:49
Surr: 1,2-Dichloroethane-d4	*92.4*			**0**	*81-118*	*%REC*	*1*	*25-Sep-2019 13:49*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*1*	*25-Sep-2019 13:49*
Surr: Dibromofluoromethane	*94.6*			**0**	*80-119*	*%REC*	*1*	*25-Sep-2019 13:49*
Surr: Toluene-d8	*100*			**0**	*89-112*	*%REC*	*1*	*25-Sep-2019 13:49*

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
Sample ID: 16LHAAP-TB2-190916
Collection Date: 16-Sep-2019 00:00

ANALYTICAL REPORT
WorkOrder:HS19090860
Lab ID:HS19090860-16
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	25-Sep-2019 14:13
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:13
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:13
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:13
Methylene chloride	1.0	U	0.40	1.0	2.0	UG/L	1	25-Sep-2019 14:13
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:13
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	25-Sep-2019 14:13
Surr: 1,2-Dichloroethane-d4	*89.6*			**0**	*81-118*	*%REC*	*1*	*25-Sep-2019 14:13*
Surr: 4-Bromofluorobenzene	*104*			**0**	*85-114*	*%REC*	*1*	*25-Sep-2019 14:13*
Surr: Dibromofluoromethane	*93.1*			**0**	*80-119*	*%REC*	*1*	*25-Sep-2019 14:13*
Surr: Toluene-d8	*98.8*			**0**	*89-112*	*%REC*	*1*	*25-Sep-2019 14:13*

Note: See Qualifiers Page for a list of qualifiers and their explanation.

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID: R346918 (0)	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS19090860-01	16WW14-190916	16 Sep 2019 13:43			24 Sep 2019 18:47	1
HS19090860-02	16WW16-190916	16 Sep 2019 14:34			24 Sep 2019 20:23	250
HS19090860-02	16WW16-190916	16 Sep 2019 14:34			24 Sep 2019 19:11	25
HS19090860-05	16WW22-190917	17 Sep 2019 09:37			24 Sep 2019 20:47	1
HS19090860-08	16WW56-190917	17 Sep 2019 13:12			24 Sep 2019 21:11	1
HS19090860-11	16WW43-190917	17 Sep 2019 12:35			24 Sep 2019 21:36	1
HS19090860-12	16WW23-190917	17 Sep 2019 13:50			24 Sep 2019 22:00	1
Batch ID: R347016 (0)	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS19090860-03	16WW36-190916	16 Sep 2019 15:37			25 Sep 2019 16:14	250
HS19090860-03	16WW36-190916	16 Sep 2019 15:37			25 Sep 2019 15:02	25
HS19090860-04	16WW42-190916	16 Sep 2019 16:33			25 Sep 2019 16:38	5
HS19090860-04	16WW42-190916	16 Sep 2019 16:33			25 Sep 2019 14:37	1
HS19090860-06	16WW41-190917	17 Sep 2019 10:35			25 Sep 2019 19:50	100
HS19090860-06	16WW41-190917	17 Sep 2019 10:35			25 Sep 2019 19:26	10
HS19090860-07	16WW39-190917	17 Sep 2019 11:43			25 Sep 2019 20:14	10
HS19090860-09	16WW40-190917	17 Sep 2019 14:09			25 Sep 2019 18:38	5
HS19090860-10	16WW55-190917	17 Sep 2019 14:54			25 Sep 2019 21:26	100
HS19090860-10	16WW55-190917	17 Sep 2019 14:54			25 Sep 2019 21:02	10
HS19090860-13	16WW24-190917	17 Sep 2019 14:55			25 Sep 2019 17:02	1
HS19090860-14	16WW27-190917	17 Sep 2019 10:25			25 Sep 2019 17:26	1
HS19090860-15	16LHAAP-TB1-190916	16 Sep 2019 00:00			25 Sep 2019 13:49	1
HS19090860-16	16LHAAP-TB2-190916	16 Sep 2019 00:00			25 Sep 2019 14:13	1
Batch ID: R347098 (0)	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS19090860-07	16WW39-190917	17 Sep 2019 11:43			27 Sep 2019 00:50	1
HS19090860-09	16WW40-190917	17 Sep 2019 14:09			27 Sep 2019 00:26	1

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID: R347481 (0)	**Test Name :** SUBCONTRACT ANALYSIS - PERCHLORATE (EPA 6850)				**Matrix:** Water	
HS19090860-01	16WW14-190916	16 Sep 2019 13:43			02 Oct 2019 16:54	1
HS19090860-02	16WW16-190916	16 Sep 2019 14:34			02 Oct 2019 16:54	1
HS19090860-03	16WW36-190916	16 Sep 2019 15:37			02 Oct 2019 16:54	1
HS19090860-04	16WW42-190916	16 Sep 2019 16:33			02 Oct 2019 16:54	1
HS19090860-05	16WW22-190917	17 Sep 2019 09:37			02 Oct 2019 16:54	1
HS19090860-06	16WW41-190917	17 Sep 2019 10:35			02 Oct 2019 16:54	1
HS19090860-07	16WW39-190917	17 Sep 2019 11:43			02 Oct 2019 16:54	1
HS19090860-08	16WW56-190917	17 Sep 2019 13:12			02 Oct 2019 16:54	1
HS19090860-09	16WW40-190917	17 Sep 2019 14:09			02 Oct 2019 16:54	1
HS19090860-10	16WW55-190917	17 Sep 2019 14:54			02 Oct 2019 16:54	1
HS19090860-11	16WW43-190917	17 Sep 2019 12:35			02 Oct 2019 16:54	1
HS19090860-12	16WW23-190917	17 Sep 2019 13:50			02 Oct 2019 16:54	1
HS19090860-13	16WW24-190917	17 Sep 2019 14:55			02 Oct 2019 16:54	1
HS19090860-14	16WW27-190917	17 Sep 2019 10:25			02 Oct 2019 16:54	1

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R346918 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190924** Units: **UG/L** Analysis Date: **24-Sep-2019 18:23**
Client ID: Run ID: **VOA6_346918** SeqNo: **5267478** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
cis-1,2-Dichloroethene	0.50	1.0								U
Methylene chloride	1.0	2.0								U
Trichloroethene	0.50	1.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*45.53*	*1.0*	*50*	*0*	*91.1*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*52.29*	*1.0*	*50*	*0*	*105*	*85 - 114*				
Surr: Dibromofluoromethane	*47.12*	*1.0*	*50*	*0*	*94.2*	*80 - 119*				
Surr: Toluene-d8	*48.88*	*1.0*	*50*	*0*	*97.8*	*89 - 112*				

LCS Sample ID: **VLCSW-190924** Units: **UG/L** Analysis Date: **24-Sep-2019 17:35**
Client ID: Run ID: **VOA6_346918** SeqNo: **5267477** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	20.45	1.0	20	0	102	80 - 119				
1,1-Dichloroethene	18.88	1.0	20	0	94.4	71 - 131				
1,2-Dichloroethane	19.55	1.0	20	0	97.8	73 - 128				
cis-1,2-Dichloroethene	19.25	1.0	20	0	96.3	78 - 123				
Methylene chloride	20.34	2.0	20	0	102	74 - 124				
Trichloroethene	18.17	1.0	20	0	90.8	79 - 123				
Vinyl chloride	18.42	1.0	20	0	92.1	58 - 137				
Surr: 1,2-Dichloroethane-d4	*52.06*	*1.0*	*50*	*0*	*104*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*52.67*	*1.0*	*50*	*0*	*105*	*85 - 114*				
Surr: Dibromofluoromethane	*52.07*	*1.0*	*50*	*0*	*104*	*80 - 119*				
Surr: Toluene-d8	*46.27*	*1.0*	*50*	*0*	*92.5*	*89 - 112*				

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R346918 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19090860-01MS** Units: **UG/L** Analysis Date: **24-Sep-2019 19:35**
Client ID: **16WW14-190916** Run ID: **VOA6_346918** SeqNo: **5267481** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	20.03	1.0	20	0	100	80 - 119				
1,1-Dichloroethene	18.21	1.0	20	0	91.1	71 - 131				
1,2-Dichloroethane	17.86	1.0	20	0	89.3	73 - 128				
cis-1,2-Dichloroethene	18.32	1.0	20	0.7892	87.6	78 - 123				
Methylene chloride	16.9	2.0	20	0	84.5	74 - 124				
Trichloroethene	45.53	1.0	20	25.26	101	79 - 123				
Vinyl chloride	15.24	1.0	20	0	76.2	58 - 137				
Surr: 1,2-Dichloroethane-d4	*45.98*	*1.0*	*50*	*0*	*92.0*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.99*	*1.0*	*50*	*0*	*102*	*85 - 114*				
Surr: Dibromofluoromethane	*47.76*	*1.0*	*50*	*0*	*95.5*	*80 - 119*				
Surr: Toluene-d8	*50.16*	*1.0*	*50*	*0*	*100*	*89 - 112*				

MSD Sample ID: **HS19090860-01MSD** Units: **UG/L** Analysis Date: **24-Sep-2019 19:59**
Client ID: **16WW14-190916** Run ID: **VOA6_346918** SeqNo: **5267482** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	19.13	1.0	20	0	95.7	80 - 119	20.03	4.57	20	
1,1-Dichloroethene	16.83	1.0	20	0	84.2	71 - 131	18.21	7.88	20	
1,2-Dichloroethane	17.29	1.0	20	0	86.5	73 - 128	17.86	3.25	20	
cis-1,2-Dichloroethene	17.19	1.0	20	0.7892	82.0	78 - 123	18.32	6.37	20	
Methylene chloride	15.87	2.0	20	0	79.4	74 - 124	16.9	6.3	20	
Trichloroethene	43.16	1.0	20	25.26	89.5	79 - 123	45.53	5.33	20	
Vinyl chloride	14.16	1.0	20	0	70.8	58 - 137	15.24	7.38	20	
Surr: 1,2-Dichloroethane-d4	*45.54*	*1.0*	*50*	*0*	*91.1*	*81 - 118*	*45.98*	*0.956*	*20*	
Surr: 4-Bromofluorobenzene	*51.94*	*1.0*	*50*	*0*	*104*	*85 - 114*	*50.99*	*1.85*	*20*	
Surr: Dibromofluoromethane	*47.56*	*1.0*	*50*	*0*	*95.1*	*80 - 119*	*47.76*	*0.403*	*20*	
Surr: Toluene-d8	*49.2*	*1.0*	*50*	*0*	*98.4*	*89 - 112*	*50.16*	*1.94*	*20*	

The following samples were analyzed in this batch: HS19090860-01 HS19090860-02 HS19090860-05 HS19090860-08 HS19090860-11 HS19090860-12

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R347016 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190925** Units: **UG/L** Analysis Date: **25-Sep-2019 12:37**
Client ID: Run ID: **VOA6_347016** SeqNo: **5269438** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
cis-1,2-Dichloroethene	0.50	1.0								U
Methylene chloride	1.0	2.0								U
Trichloroethene	0.50	1.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*44.75*	*1.0*	*50*	*0*	*89.5*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*51.44*	*1.0*	*50*	*0*	*103*	*85 - 114*				
Surr: Dibromofluoromethane	*46.53*	*1.0*	*50*	*0*	*93.1*	*80 - 119*				
Surr: Toluene-d8	*50.44*	*1.0*	*50*	*0*	*101*	*89 - 112*				

LCS Sample ID: **VLCSW-190925** Units: **UG/L** Analysis Date: **25-Sep-2019 11:49**
Client ID: Run ID: **VOA6_347016** SeqNo: **5269437** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	20.5	1.0	20	0	102	80 - 119				
1,1-Dichloroethene	18.3	1.0	20	0	91.5	71 - 131				
1,2-Dichloroethane	19.2	1.0	20	0	96.0	73 - 128				
cis-1,2-Dichloroethene	18.83	1.0	20	0	94.1	78 - 123				
Methylene chloride	20.03	2.0	20	0	100	74 - 124				
Trichloroethene	17.97	1.0	20	0	89.9	79 - 123				
Vinyl chloride	17.8	1.0	20	0	89.0	58 - 137				
Surr: 1,2-Dichloroethane-d4	*51.58*	*1.0*	*50*	*0*	*103*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*53.54*	*1.0*	*50*	*0*	*107*	*85 - 114*				
Surr: Dibromofluoromethane	*52.18*	*1.0*	*50*	*0*	*104*	*80 - 119*				
Surr: Toluene-d8	*47.71*	*1.0*	*50*	*0*	*95.4*	*89 - 112*				

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R347016 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19090847-01MS** Units: **UG/L** Analysis Date: **25-Sep-2019 15:26**
Client ID: Run ID: **VOA6_347016** SeqNo: **5269445** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	19.48	1.0	20	0	97.4	80 - 119				
1,1-Dichloroethene	17.22	1.0	20	0	86.1	71 - 131				
1,2-Dichloroethane	17.76	1.0	20	0	88.8	73 - 128				
cis-1,2-Dichloroethene	19.9	1.0	20	2.121	88.9	78 - 123				
Methylene chloride	16.8	2.0	20	0	84.0	74 - 124				
Trichloroethene	19.82	1.0	20	1.026	94.0	79 - 123				
Vinyl chloride	14.35	1.0	20	0	71.7	58 - 137				
Surr: 1,2-Dichloroethane-d4	*45.47*	*1.0*	*50*	*0*	*90.9*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.55*	*1.0*	*50*	*0*	*101*	*85 - 114*				
Surr: Dibromofluoromethane	*46.94*	*1.0*	*50*	*0*	*93.9*	*80 - 119*				
Surr: Toluene-d8	*49.26*	*1.0*	*50*	*0*	*98.5*	*89 - 112*				

MSD Sample ID: **HS19090847-01MSD** Units: **UG/L** Analysis Date: **25-Sep-2019 15:50**
Client ID: Run ID: **VOA6_347016** SeqNo: **5269446** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	18.64	1.0	20	0	93.2	80 - 119	19.48	4.39	20	
1,1-Dichloroethene	15.96	1.0	20	0	79.8	71 - 131	17.22	7.58	20	
1,2-Dichloroethane	17.06	1.0	20	0	85.3	73 - 128	17.76	4.01	20	
cis-1,2-Dichloroethene	18.34	1.0	20	2.121	81.1	78 - 123	19.9	8.14	20	
Methylene chloride	16.12	2.0	20	0	80.6	74 - 124	16.8	4.15	20	
Trichloroethene	18.29	1.0	20	1.026	86.3	79 - 123	19.82	8.06	20	
Vinyl chloride	13.44	1.0	20	0	67.2	58 - 137	14.35	6.54	20	
Surr: 1,2-Dichloroethane-d4	*45.03*	*1.0*	*50*	*0*	*90.1*	*81 - 118*	*45.47*	*0.978*	*20*	
Surr: 4-Bromofluorobenzene	*52.22*	*1.0*	*50*	*0*	*104*	*85 - 114*	*50.55*	*3.25*	*20*	
Surr: Dibromofluoromethane	*47.19*	*1.0*	*50*	*0*	*94.4*	*80 - 119*	*46.94*	*0.529*	*20*	
Surr: Toluene-d8	*48.77*	*1.0*	*50*	*0*	*97.5*	*89 - 112*	*49.26*	*1*	*20*	

The following samples were analyzed in this batch:

HS19090860-03	HS19090860-04	HS19090860-06	HS19090860-07
HS19090860-09	HS19090860-10	HS19090860-13	HS19090860-14
HS19090860-15	HS19090860-16		

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R347098 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MBLK Sample ID: **VBLKW-190926** Units: **UG/L** Analysis Date: **26-Sep-2019 16:01**
Client ID: Run ID: **VOA6_347098** SeqNo: **5271542** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
cis-1,2-Dichloroethene	0.50	1.0								U
Methylene chloride	1.0	2.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*44.43*	*1.0*	*50*	*0*	*88.9*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*52.49*	*1.0*	*50*	*0*	*105*	*85 - 114*				
Surr: Dibromofluoromethane	*46.58*	*1.0*	*50*	*0*	*93.2*	*80 - 119*				
Surr: Toluene-d8	*48.94*	*1.0*	*50*	*0*	*97.9*	*89 - 112*				

LCS Sample ID: **VLCSW-190926** Units: **UG/L** Analysis Date: **26-Sep-2019 15:13**
Client ID: Run ID: **VOA6_347098** SeqNo: **5271541** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	19.84	1.0	20	0	99.2	80 - 119				
1,1-Dichloroethene	18.21	1.0	20	0	91.1	71 - 131				
1,2-Dichloroethane	18.48	1.0	20	0	92.4	73 - 128				
cis-1,2-Dichloroethene	18.28	1.0	20	0	91.4	78 - 123				
Methylene chloride	18.89	2.0	20	0	94.5	74 - 124				
Vinyl chloride	17.83	1.0	20	0	89.1	58 - 137				
Surr: 1,2-Dichloroethane-d4	*46.73*	*1.0*	*50*	*0*	*93.5*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.1*	*1.0*	*50*	*0*	*100*	*85 - 114*				
Surr: Dibromofluoromethane	*48.37*	*1.0*	*50*	*0*	*96.7*	*80 - 119*				
Surr: Toluene-d8	*45.53*	*1.0*	*50*	*0*	*91.1*	*89 - 112*				

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: HS19090860

QC BATCH REPORT

Batch ID: R347098 (0) **Instrument:** VOA6 **Method:** VOLATILES ORGANICS BY METHOD 8260C

MS Sample ID: **HS19090962-12MS** Units: **UG/L** Analysis Date: **26-Sep-2019 18:25**
Client ID: Run ID: **VOA6_347098** SeqNo: **5271548** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	19.64	1.0	20	0	98.2	80 - 119				
1,1-Dichloroethene	17.64	1.0	20	0.5633	85.4	71 - 131				
1,2-Dichloroethane	17.08	1.0	20	0	85.4	73 - 128				
cis-1,2-Dichloroethene	16.97	1.0	20	0	84.8	78 - 123				
Methylene chloride	16.28	2.0	20	0	81.4	74 - 124				
Vinyl chloride	14.19	1.0	20	0	70.9	58 - 137				
Surr: 1,2-Dichloroethane-d4	*44.78*	*1.0*	*50*	*0*	*89.6*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*51.41*	*1.0*	*50*	*0*	*103*	*85 - 114*				
Surr: Dibromofluoromethane	*46.8*	*1.0*	*50*	*0*	*93.6*	*80 - 119*				
Surr: Toluene-d8	*49.33*	*1.0*	*50*	*0*	*98.7*	*89 - 112*				

MSD Sample ID: **HS19090962-12MSD** Units: **UG/L** Analysis Date: **26-Sep-2019 18:49**
Client ID: Run ID: **VOA6_347098** SeqNo: **5271549** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,2-Trichloroethane	19.39	1.0	20	0	97.0	80 - 119	19.64	1.26	20	
1,1-Dichloroethene	16.74	1.0	20	0.5633	80.9	71 - 131	17.64	5.28	20	
1,2-Dichloroethane	16.96	1.0	20	0	84.8	73 - 128	17.08	0.69	20	
cis-1,2-Dichloroethene	16.17	1.0	20	0	80.9	78 - 123	16.97	4.79	20	
Methylene chloride	15.61	2.0	20	0	78.0	74 - 124	16.28	4.25	20	
Vinyl chloride	12.99	1.0	20	0	65.0	58 - 137	14.19	8.78	20	
Surr: 1,2-Dichloroethane-d4	*43.8*	*1.0*	*50*	*0*	*87.6*	*81 - 118*	*44.78*	*2.21*	*20*	
Surr: 4-Bromofluorobenzene	*50.72*	*1.0*	*50*	*0*	*101*	*85 - 114*	*51.41*	*1.35*	*20*	
Surr: Dibromofluoromethane	*46.33*	*1.0*	*50*	*0*	*92.7*	*80 - 119*	*46.8*	*1.01*	*20*	
Surr: Toluene-d8	*49.14*	*1.0*	*50*	*0*	*98.3*	*89 - 112*	*49.33*	*0.388*	*20*	

The following samples were analyzed in this batch: HS19090860-07 HS19090860-09

ALS Houston, US Date: 02-Oct-19

Client: Aptim Environmental & Infrastucture, Inc.
Project: Longhorn Army Ammunition Plant
WorkOrder: **HS19090860**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	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

Acronym	Description
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 Quantitaion Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	19-028-0	27-Mar-2020
California	2919, 2019-2020	30-Apr-2020
Dept of Defense	ANAB L2231	20-Dec-2021
Florida	E87611-28	30-Jun-2020
Illinois	2000322019-2	09-May-2020
Kansas	E-10352 2019-2020	31-Jul-2020
Kentucky	123043, 2019-2020	30-Apr-2020
Louisiana	03087, 2019-2020	30-Jun-2020
Maryland	343, 2019-2020	30-Jun-2020
North Carolina	624-2019	31-Dec-2019
North Dakota	R-193 2019-2020	30-Apr-2020
Oklahoma	2019-141	31-Aug-2020
Texas	TX104704231-19-23	30-Apr-2020

ALS Houston, US Date: 02-Oct-19

Sample Receipt Checklist

Client Name: CBI-Houston
Work Order: HS19090860

Date/Time Received: **18-Sep-2019 09:00**
Received by: **AC**

Checklist completed by: *Paresh M. Giga* eSignature 18-Sep-2019 Date

Reviewed by: *RJ Modashia* eSignature 19-Sep-2019 Date

Matrices: **Water**

Carrier name: **FedEx**

	Yes	No	
Shipping container/cooler in good condition?	☑	☐	Not Present ☐
Custody seals intact on shipping container/cooler?	☑	☐	Not Present ☐
Custody seals intact on sample bottles?	☐	☐	Not Present ☑
VOA/TX1005/TX1006 Solids in hermetically sealed vials?	☐	☐	Not Present ☑
Chain of custody present?	☑	☐	2 Page(s)
Chain of custody signed when relinquished and received?	☑	☐	COC IDs:None
Samplers name present on COC?	☐	☑	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	

Temperature(s)/Thermometer(s):	1.4c; 3.3c U/c	IR25
Cooler(s)/Kit(s):	45192/43815	
Date/Time sample(s) sent to storage:	9/18/19 20:05	

	Yes	No	
Water - VOA vials have zero headspace?	☑	☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	☐	☐	N/A ☑
pH adjusted?	☐	☐	N/A ☑

pH adjusted by:

Login Notes: 16WW27-190917 not checked off for analysis on COC
Logged in with analysis

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

APTIM

COC ID: LHAAP16-SEPT2019-ALSHT-1909-17 | TURNAROUND TIME: normal | RUSH: | Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY						
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories				Fedinvoices @aptim.com	
Project Number	501032			Lab Contact	RJ Modashia					
	LHAAP-16			Email	RJ.Modashia@alsglobal.com				Susan.Huang@aptim.com	
Address	1203-B East Grand Avenue			Address	10450 Stancliff Rd., Suite 210				Susan Huang	
	PMB 202								4005 Port Chicago Hwy	
City	Marshall	State	TX	City	Houston	State	TX		Concord	State CA
Postal Code	75670	Country	USA	Postal Code	77099	Country	USA		94520	Country USA
Phone Number	713.243.7264			Phone Number	281.575.2279 or 281.530.5656					
Project Manager	Praveen Srivastav									

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	VOCs in Water by 8260B (see required VOCs below)	Perchlorate in Water by 6850	Alkalinity (SM2320B)	Anions by E300.0 (see required anions below)	Dissolved Gases (methane, ethane, and ethene) by RSK-175	TOC by (SM5310C)
								Containers and Preservative	3x40 ml VOA, HCL	1x125 ml HPDE, Ice	1x250 ml HPDE, Ice		3x40 ml VOA, HCL	2x40 ml VOA, H2SO4
16WW14-190916						9/16/19	1343	4	X	X				
16WW16-190916						9/16/19	1434	4	X	X				
16WW36-190916						9/16/19	1537	4	X	X				
16WW42-190916						9/16/19	1633	4	X	X				
16WW22-190917						9/17/19	937	4	X	X				
16WW41-190917						9/17/19	1035	4	X	X				
16WW39-190917						9/17/19	1143	4	X	X				
16WW56-190917						9/17/19	1312	4	X	X				
16WW40-190917						9/17/19	1409	4	X	X				
16WW55-190917						9/17/19	1454	4	X	X				
16WW43-190917						9/17/19	1235	4	X	X				
16WW23-190917						9/17/19	1350	4	X	X				
16WW24-190917						9/17/19	1455	4	X	X				
16WW27-190917						9/17/19	1025	4						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride Required anions are: (1) bromide for sample 16WW49; and (2) nitrate, sulfate and bromide for samples 16WW57 and 16WW58	Wesley Owen Aptim	9/17/19 1400	AC ALS	9/18/19 09:00

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant

HS19090860

43815 - Temp 4.3.3

ALS

01029796

APTIM

COC ID: LHAAP16-SEPT2019-ALSHT-1909- TURNAROUND TIME: normal RUSH: Page 1 of 1

PROJECT/CLIENT INFO				LABORATORY							
Facility Name	Longhorn AAP			Lab Name	ALS Laboratories				Fedinvoices @aptim.com		
Project Number	501032			Lab Contact	RJ Modashia						
	LHAAP-16			Email	RJ.Modashia@alsglobal.com				Susan.Huang@aptim.com		
Address	1203-B East Grand Avenue			Address	10450 Stancliff Rd., Suite 210				Susan Huang		
	PMB 202								4005 Port Chicago Hwy		
City	Marshall	State	TX	City	Houston	State	TX		Concord	State	CA
Postal Code	75670	Country	USA	Postal Code	77099	Country	USA		94520	Country	USA
Phone Number	713.243.7264			Phone Number	281.575.2279 or 281.530.5656						
Project Manager	Praveen Srivastav										

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Location	Start Depth	End Depth	Depth Unit	Field Matrix	Date	Time (24hr)	# Of Cont.	ANALYSIS	VOCs in Water by 8260B (see required VOCs below)	Perchlorate in Water by 6850	Alkalinity (SM2320B)	Anions by E300.0 (see required anions below)	Dissolved Gases (methane, ethane, and ethene) by RSK-175	TOC by (SM5310C)
								Containers and Preservative		3x40 ml VOA, HCL	1x125 ml HPDE, Ice	1x250 ml HPDE, Ice		3x40 ml VOA, HCL	2x40 ml VOA, H_2SO_4
16LHAAP-TB1-190916						9/16/19	6:5	2		X					
16LHAAP-TB2-190916						9/17/19	6:3	2		X					

Aptim Environmental & Infrastucture, Inc.
Longhorn Army Ammunition Plant

HS19090860

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Select list VOC's (TCE, cis-1,2-DCE, 1,1-DCE, 1,2-DCA, 1,1,2-TCA, VC & methylene chloride	[illegible] APTIM	9/17/19 1400	AC ALS	9/18/19 0700
Required anions are: (1) bromide for sample 16WW49; and (2) nitrate, sulfate and bromide for samples 16WW57 and 16WW58				

CI 5.1-12 - Temp 43815 - Temp ucc 3.3

45192 SEP 18 2019

45192

ORIGIN ID:CHVA (361) 463-3949
WESLEY ALVINO GARCIA
102 RESACA LN
ROCKPORT, TX 78382
UNITED STATES US

SHIP DATE: 17SEP19
ACTWGT: 29.70 LB
CAD: 6994980/SSHE2032
DIMS: 19x13x16 IN
BILL CREDIT CARD

TO ALS ENVIROMENT HOUSTON LA
ALS ENVIROMENT HOUSTON LAB
10450 STANCLIFF RD
STE 210
HOUSTON TX 77099

(281) 590 3850 REF:
INV:
PO: DEPT:

FedEx Express

TRK# (0201) 7898 7788 2822

WED - 18 SEP 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US IAH

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

43815

CUSTODY SEAL
Date: Time:
Name:
Comp:

Seal Broken By:
Date: 09/18/19

43815 SEP 18 2019

ALS
10450 Stancliff Rd., Suite 210
Houston, Texas 77099
Tel. +1 281 530 5656
Fax. +1 281 530 5887

43815

CUSTODY SEAL
Date: Time:
Name:
Comp:

Seal Broken By:
Date: 09/18/19

Must Deliver Next Business Day
Time and Tempature Sensitive!

43815

ORIGIN ID:SGRA (903) 930-6193
SCOTT BEESINER
[illegible] GRAND AVE. PMB202
[illegible], TX 75670
UNITED STATES US

SHIP DATE: 11SEP19
ACTWGT: 1.00 LB MAN
CAD: 300130/CAFE3211
DIMS: 19x16x13 IN

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP 16-BO 67526-RJ
RMA:

FedEx Express
E

FedEx
TRK# 4809 7837 8267
0221

WED - 18 SEP 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US IAH

Case Narrative

Method: 6850
Analysis: Perchlorate
Analysis SOP: LC-MS-CLO4
ALS WO ID(s): 1927206; 1927207

Client: ALS Laboratories (Houston, TX)
Matrix: Water
ELMS Batch (HBN): 2294 (248518)

General Set Information: There were fifteen field samples in these Work Orders. The samples were analyzed for perchlorate.

Method Summary: Each sample was prepared as noted below and analyzed using an Agilent 1100 LC/MSD system in select ion monitoring (SIM) mode at m/z 83 and 85, which corresponds to the loss of one oxygen atom from the perchlorate molecule. ChemStation software was used for instrument control and data analysis. The ion ratio of m/z 83 to 85 was used to positively identify the response peak as perchlorate. Quantitation was performed using the m/z 83 peak area. An internal standard (ISTD) of ^{18}O labeled perchlorate was added to each sample to establish the perchlorate peak retention time and used in quantitation.

Sample Preparation: A 10.0mL aliquot of each sample was transferred into a 15-mL centrifuge tube. 50µL of an ^{18}O labeled perchlorate solution was added to each sample as an internal standard. The samples were then capped, vortexed, and filtered into autosampler vial using Phenex PES membrane 0.45µm Syringe filters.

Holding Times: Holding times were met for all analyses.

Dilutions: Field samples 1927207002/07/10 were analyzed and reported from 1:10 dilutions. The reporting limits have been adjusted accordingly.

Method QC data: The method blank (LMB 675448) was less than 1/2 the CRDL. The recovery for the LCS (675449) was within acceptable parameters.

MS/MSD Analysis: MS/MSD was performed on sample 1927206001 (Client ID: LH18/24-SP650_091719_AIX). 3.0µL of Working Standard Solution Horizon ID 49947 was added to 10.0mL of sample preparation. The spike target was 3.µg/L. The MS/MSD percent recoveries and relative percent difference (RPD) were within the performance limits.

Instrument QC: Instrument initial and continuing calibrations were performed in accordance with published procedures.

NC/CAR(s): NA

Sample Calculation: Samples were reported in µg/L. Results were calculated in µg/L by the equation (A)x(B),

where: A = Analyte concentration from the standard curve (µg/L)
B = Dilution performed at time of analysis

Miscellaneous Comments: These samples were analyzed in accordance with the requirements found in the DOD QSM Version 5.1.1. The Reporting Limit Verification Standard (RLVS – 675446) is reported from the analysis of the Laboratory Control Sample (LCS – 675449) at a level of 3.0µg/L. Due to limitations of the Chemstation Software, some of the chromatographic peaks may require manual integrations. A manual integration was performed for one of the Initial Calibration analyses (datafile: 20SEPI03) along with datafiles 20SEPD13/23. Field samples 1927207006/09 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.

Thomas Bosch	September 26, 2019
Analyst	Date

ANALYTICAL REPORT

Report Date: October 01, 2019

RJ Modashia
ALS Environmental (Houston)
10450 Stancliff Road
Suite 210
Houston, TX 77099

Phone: 281 530-5656

E-mail: RJ.Modashia@ALSGlobal.com

Workorder: **34-1927207**
Project ID: HS19090860
Purchase Order: HS19090860
Project Manager Kevin W. Griffiths

Client Sample ID	Lab ID	Collect Date	Receive Date	Sampling Site
16WW14-190916	1927207001	09/16/19	09/21/19	
16WW16-190916	1927207002	09/16/19	09/21/19	
16WW36-190916	1927207003	09/16/19	09/21/19	
16WW42-190916	1927207004	09/16/19	09/21/19	
16WW22-190917	1927207005	09/17/19	09/21/19	
16WW41-190917	1927207006	09/17/19	09/21/19	
16WW39-190917	1927207007	09/17/19	09/21/19	
16WW56-190917	1927207008	09/17/19	09/21/19	
16WW40-190917	1927207009	09/17/19	09/21/19	
16WW55-190917	1927207010	09/17/19	09/21/19	
16WW43-190917	1927207011	09/17/19	09/21/19	
16WW23-190917	1927207012	09/17/19	09/21/19	
16WW24-190917	1927207013	09/17/19	09/21/19	
16WW27-190917	1927207014	09/17/19	09/21/19	

ANALYTICAL REPORT

Workorder: 34-1927207
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW14-190916** | Sampling Site: NA | Collected: 09/16/2019
Lab ID: 1927207001 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 10:15 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW16-190916** | Sampling Site: NA | Collected: 09/16/2019
Lab ID: 1927207002 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 10:28 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**460**	10	20	40	10	

Sample ID: **16WW36-190916** | Sampling Site: NA | Collected: 09/16/2019
Lab ID: 1927207003 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 10:42 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW42-190916** | Sampling Site: NA | Collected: 09/16/2019
Lab ID: 1927207004 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 10:56 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

ANALYTICAL REPORT

Workorder: 34-1927207
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW22-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207005 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 11:10 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW41-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207006 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 11:24 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW39-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207007 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 11:37 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**130**	10	20	40	10	

Sample ID: **16WW56-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207008 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 11:51 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

ANALYTICAL REPORT

Workorder: 34-1927207
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW40-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207009 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 12:05 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW55-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207010 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 12:34 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	**480**	10	20	40	10	

Sample ID: **16WW43-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207011 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 12:48 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW23-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207012 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water | **Instrument ID:** LCMS04
Batch: ELMS/2294 (HBN: 248518) | **%Solids:** NA
Analyzed: 09/25/2019 13:02 | **Report Basis:** Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

ANALYTICAL REPORT

Workorder: 34-1927207
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

Analytical Results

Sample ID: **16WW24-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207013 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2294 (HBN: 248518)
Analyzed: 09/25/2019 13:16
Instrument ID: LCMS04
%Solids: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Sample ID: **16WW27-190917** | Sampling Site: NA | Collected: 09/17/2019
Lab ID: 1927207014 | Media: 125 mL Nalgene | Received: 09/21/2019
Matrix: Water | Sampling Parameter: NA

Analysis Method - EPA 6850, DoD QSM

Preparation: Not Applicable
Analysis: EPA 6850, DoD QSM Water
Batch: ELMS/2294 (HBN: 248518)
Analyzed: 09/25/2019 13:30
Instrument ID: LCMS04
%Solids: NA
Report Basis: Wet

Analyte	Result (ug/L)	DL (ug/L)	LOD (ug/L)	LOQ (ug/L)	Dilution	Qual
Perchlorate	ND	1.0	2.0	4.0	1	U

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA 6850, DoD QSM	/S/ Thomas Bosch 09/26/2019 12:48	/S/ Stephen Brose 10/01/2019 11:46

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1927207
Client: ALS Environmental (Houston)
Project Manager: Kevin W. Griffiths

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	PJLA (DoD ELAP)	L17-506	http://www.pjlabs.com
	PJLA (ISO 17025)	L17-507-R1	http://www.pjlabs.com
	Utah (TNI)	UT00953	http://lams.nelac-institute.org/search
	Iowa (TNI)	IA# 376	http://www.shl.uiowa.edu/labcert/idnr/
	Kansas	E-10416	http://www.kdheks.gov/envlab/disclaimer.html
Industrial Hygiene	AIHA (ISO 17025 & AIHA IHLAP)	101574	http://www.aihaaccreditedlabs.org
	DOECAP-AP	L18-606	http://www.pjlabs.com
	Washington	C596	https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Laboratory-Accreditation
Dietary Supplements	PJLA (ISO 17025)	L17-507-R1	http://www.pjlabs.com

Result Symbol Definitions

MDL = Method Detection Limit, a statistical estimate of method/media/instrument sensitivity.
RL = Reporting Limit, a verified value of method/media/instrument sensitivity.
CRDL = Contract Required Detection Limit
Reg. Limit = Regulatory Limit.
ND = Not Detected, testing result not detected above the MDL or RL.
< Means this testing result is less than the numerical value.
** No result could be reported, see sample comments for details.

Qualifier Symbol Definitions

U = Qualifier indicates that the analyte was not detected above the MDL.
J = Qualifier Indicates that the analyte value is between the MDL and the RL. It is also used to indicate an estimated value for tentatively identified compounds in mass spectrometry where a 1:1 response is assumed.
B = Qualifier indicates that the analyte was detected in the blank.
E = Qualifier indicates that the analyte result exceeds calibration range.
P = Qualifier indicates that the RPD between the two columns is greater than 40%.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1927207

Limits:	Client SOW/Contract Specified	**Preparation:**	NA	**Analysis:**	EPA 6850, DoD QSM
Basis:	DoD QSM	**Batch:**	NA	**Batch:**	ELMS/2294 (HBN: 248518)
		Prepared By:	NA	**Analyzed By:**	Thomas Bosch

Blank

LMB: 675448
Analyzed: 09/25/2019 09:19
Units: ug/L

Analyte	Result	MDL	RL
Perchlorate	ND	1	2.00

Laboratory Control Sample

LCS: 675449
Analyzed: 09/25/2019 08:52
Dilution: 1
Units: ug/L

Analyte	Result	Target	% Rec	QC Limits	
Perchlorate	3.01	3.00	100	78.8	123.8

Matrix Spike - Matrix Spike Duplicate

Sample:	1927206001	**MS:**	675450				**MSD:**	675451			
Analyzed:	09/25/2019 09:33	**Analyzed:**	09/25/2019 09:47				**Analyzed:**	09/25/2019 10:01			
Dilution:	1	**Dilution:**	1				**Dilution:**	1			
Units:	ug/L	**Units:**	ug/L				**Units:**	ug/L			
Analyte	**Result**	**Result**	**Target**	**% Rec**	**QC Limits**		**Result**	**% Rec**	**RPD**	**QC Limits**	
Perchlorate	ND	2.81	3	93.6	78.8	123.8	2.86	95.2	1.73	0.0	20.0

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Thomas Bosch	/S/ Stephen Brose
09/26/2019 12:51	10/01/2019 11:46

Symbols and Definitions

- ✱ - Analyte above reporting limit or outside of control limits
- ▲ - Sample result is greater than 4 times the spike added
- ◆ - Sample and Matrix Duplicate less than 5 times the reporting limit
- ✹ - Result is above the calibration range
- # - The Matrix Spike, Matrix Spike duplicate or Matrix Duplicate is reported for your information only. The sample matrix may be inappropriate for the method selected.

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

1927207

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

18698/#2

SAMPLING STATE: **Texas**

COC ID: **12190**

1927207

SUBCONTRACT TO:

ALS Laboratory Group
960 LeVoy Dr
Salt Lake City, UT 84123

Phone: +1 801 266 7700

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:
Email:

INVOICE INFORMATION:

Company: ALS Houston
Contact: Accounts Payable
Address: 10450 Stancliff Rd, Ste 210
Phone: +1 281 530 5656
Reference: HS19090860
TSR: Sonia West

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS19090860-01**	**16WW14-190916**	**Water**	**16 Sep 2019 13:43**
	SUB_Perch-6850			02 Oct 2019
2.	**HS19090860-02**	**16WW16-190916**	**Water**	**16 Sep 2019 14:34**
	SUB_Perch-6850			02 Oct 2019
3.	**HS19090860-03**	**16WW36-190916**	**Water**	**16 Sep 2019 15:37**
	SUB_Perch-6850			02 Oct 2019
4.	**HS19090860-04**	**16WW42-190916**	**Water**	**16 Sep 2019 16:33**
	SUB_Perch-6850			02 Oct 2019
5.	**HS19090860-05**	**16WW22-190917**	**Water**	**17 Sep 2019 09:37**
	SUB_Perch-6850			02 Oct 2019
6.	**HS19090860-06**	**16WW41-190917**	**Water**	**17 Sep 2019 10:35**
	SUB_Perch-6850			02 Oct 2019
7.	**HS19090860-07**	**16WW39-190917**	**Water**	**17 Sep 2019 11:43**
	SUB_Perch-6850			02 Oct 2019
8.	**HS19090860-08**	**16WW56-190917**	**Water**	**17 Sep 2019 13:12**
	SUB_Perch-6850			02 Oct 2019
9.	**HS19090860-09**	**16WW40-190917**	**Water**	**17 Sep 2019 14:09**

Subcontract Chain of Custody

SAMPLING STATE: **Texas** **COC ID: 12190**

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
	SUB_Perch-6850			02 Oct 2019
10.	**HS19090860-10**	**16WW55-190917**	**Water**	**17 Sep 2019 14:54**
	SUB_Perch-6850			02 Oct 2019
11.	**HS19090860-11**	**16WW43-190917**	**Water**	**17 Sep 2019 12:35**
	SUB_Perch-6850			02 Oct 2019
12.	**HS19090860-12**	**16WW23-190917**	**Water**	**17 Sep 2019 13:50**
	SUB_Perch-6850			02 Oct 2019
13.	**HS19090860-13**	**16WW24-190917**	**Water**	**17 Sep 2019 14:55**
	SUB_Perch-6850			02 Oct 2019
14.	**HS19090860-14**	**16WW27-190917**	**Water**	**17 Sep 2019 10:25**
	SUB_Perch-6850			02 Oct 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:	[signature]	Date/Time:	9/19/19 1800.
Received By:	Meredith Drum	Date/Time:	9/21/2019 915
Cooler ID(s):	9 810	Temperature(s):	2°

ALS-Salt Lake City-Related Information Report (CRIR)

Cooler or Container Information Checklist (Fill In or Circle)

Client Name: ALS Houston

Project/Task/Site: 1927207

Date/Time of Receipt: 9/21/19 1915

Number of Coolers Received: 1

Condition of Coolers:	Acceptable/Unacceptable	Temperature Control:	Present/Not Included
Cooler Custody Seals:	Present/Absent/NA Intact/Broken/NA	Location Temp Taken:	Control/Between Samples
Container Custody Seals:	Present/Absent/NA Intact/Broken/NA	Are all temperatures within project specific guidelines?	Yes/No/NA
Ice Present:	Yes/No/NA Frozen/Melted/NA	VOA Headspace Present?	Yes/No/NA

pH Check Performed:						
	Metals	Yes/No/NA	Total Phenolics	Yes/No/NA	NO3/NO2	Yes/No/NA
	Cyanide	Yes/No/NA	TPH – 418.1	Yes/No/NA	Oil & Grease	Yes/No/NA
	Sulfide	Yes/No/NA	COD	Yes/No/NA	Total Phosphorous	Yes/No/NA
	Ammonia	Yes/No/NA	TKN	Yes/No/NA	Gross A.B, Gamma Spec	Yes/No/NA

Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.	Cooler Received	DCL Cooler No.	Temp.
1	C19 01890	2 °C	4	C19	°C	7	C19	°C
2	C19	°C	5	C19	°C	8	C19	°C
3	C19	°C	6	C19	°C	9	C19	°C

Taken By: Meredith Edwards (Signature) Meredith Edwards (Printed Name) 9/21/2019 (Date)

Client-Related Information

- ☐ Missing Cooler
- ☐ Cooler Conditions
- ☐ Missing Paperwork
- ☐ Missing/Incorrect Bottle Labels
- ☐ Missing Samples/Bottles
- ☐ Broken/Leaking Samples
- ☐ Incorrect Bottle Type
- ☐ Cooler Temperatures Out of Range
- ☐ Incorrect Preservation
- ☐ pH Criteria Not Met
- ☐ Residual Chlorine Present
- ☐ Head Space in Bottles
- ☐ Insufficient Sample Volume
- ☐ Chain of Custody Problems
- ☐ Other:

Briefly Describe the Problem and the Action Taken:

Client Notified? Yes ☐ No ☐

Response Required Within 24 Hours

Project Management

Project Manager Comments:

ALS Project Manager: _____ (Printed Name) Returned to Sample Receipt by: _____ (Signature) Date: _____

CRIR.doc

Revised 01/01/2018

Part #:159469-434 RIT2 EXP 05/20 *

ORIGIN ID:SGRA (281) 530-5656
SHIPPING DEPT
ALS LABORATORY GROUP
10450 STANCLIFF RD
SUITE 210
HOUSTON, TX 77099
UNITED STATES US

SHIP DATE: 20SEP19
ACTWGT: 41.45 LB
CAD: 300130/CAFE3211
DIMS: 26x14x14 IN

BILL THIRD PARTY

TO SAMPLE RECEIVING
ALS ENVIRONMENTAL
960 W. LEVOY DRIVE

SALT LAKE CITY UT 84123
(801) 266-7700
REF: HS19090804/860/962/964-RJ

FedEx Express

SATURDAY 12:00P
PRIORITY OVERNIGHT

TRK# 0201 1251 0289 7452

XO BTFA

84123
UT-US SLC

ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS19090860 | ***Split:*** | **Workorder ID:** 1927207 | **Level:** ENV_LVL4

Client: ALS Environmental (Houston) | **Account:** 8101 | **Type:** 125Poly

Comments:

Preservatives: COOL

Requested Analysis: EPA 6850, DoD QSM

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	EPA 6850, DoD QSM
1	09/16/2019 13:43	16WW14-190916	1927207001		Water	A	1	A
2	09/16/2019 14:34	16WW16-190916	1927207002		Water	A	1	A
3	09/16/2019 15:37	16WW36-190916	1927207003		Water	A	1	A
4	09/16/2019 16:33	16WW42-190916	1927207004		Water	A	1	A
5	09/17/2019 09:37	16WW22-190917	1927207005		Water	A	1	A
6	09/17/2019 10:35	16WW41-190917	1927207006		Water	A	1	A
7	09/17/2019 11:43	16WW39-190917	1927207007		Water	A	1	A
8	09/17/2019 13:12	16WW56-190917	1927207008		Water	A	1	A
9	09/17/2019 14:09	16WW40-190917	1927207009		Water	A	1	A
10	09/17/2019 14:54	16WW55-190917	1927207010		Water	A	1	A

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Warath, Julie	09/21/2019 09:15	ALS Sample Receiving	Sample Login
Julie Warath	9/23/19 1600	ISC	Storage
R.33.1	09.24.19/09:00	T. Bush	CL04 ANALYSIS

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

ALS Environmental

CHAIN-OF-CUSTODY

Project / Job / Task: HS19090860	Split:	Workorder ID: 1927207	Level: ENV_LVL4
Client: ALS Environmental (Houston)		Account: 8101	Type: 125Poly
Comments:			Preservatives: COOL

Item	Collect Date/Time	Sample ID	Lab ID	QC	Matrix	Containers ID(s)	Containers Count	Requested Analysis: EPA 6850, DoD QSM
11	09/17/2019 12:35	16WW43-190917	1927207011		Water	A	1	A
12	09/17/2019 13:50	16WW23-190917	1927207012		Water	A	1	A
13	09/17/2019 14:55	16WW24-190917	1927207013		Water	A	1	A
14	09/17/2019 10:25	16WW27-190917	1927207014		Water	A	1	A
15								
16								
17								
18								
19								
20								

ORIGINAL FIELD SAMPLE CHAIN-OF-CUSTODY

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location
Wärath, Julie	09/21/2019 09:15	ALS Sample Receiving	Sample Login
[signature]	9/23/19 1600	15C	Storage
R.33.1	09.24.19/09:00	T. Bush	CLO4 ANALYSIS

SAMPLE PREPARATION / ANALYSIS CHAIN-OF-CUSTODY

Sample Prep / Analysis for: _____ Lab Notebook No.: _____

Prepared / Analyzed by: _____ Date / Time: _____

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Reason for Transfer / Storage Location

Batch Worklist

Batch: ELMS/ 2294 **Created:** 9/25/2019 07:49 **Instrument:** **HBN:** 248518

Rule: EPA 6850, DoD QSM Water **Analyst:** T. Bosch **Status:** WP

Workorder: 1927206 [ENV_LVL4]

Workorder: 1927207 [ENV_LVL4]

Pos	Lab ID	Sample ID	Prep Initial	Prep Final	Dust Weight	Type	Mx	Container	Procedure	Mgr	Expire Date	Due Date	Run Date
1	675445	CCV for HBN 248518 [ELMS/2294]				CCV	3		E685041C3Q	5311		10/3/2019	
2	675446	RLVS for HBN 248518 [ELMS/2294				RLVS	3		E685041C3Q	5311		10/3/2019	
3	675447	ICS for HBN 248518 [ELMS/2294]				ICS	3		E6850..D3Q	5311		10/3/2019	
4	675448	LMB for HBN 248518 [ELMS/2294]				LMB	3		E6850Q413Q	5311		10/3/2019	
5	675449	LCS for HBN 248518 [ELMS/2294]				LCS	3		E6850Q413Q	5311		10/3/2019	
6	1927206001	LH18/24-SP650_091719_AIX				SAMPLE	3	1927206001-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
7	675450	LH18/24-SP650...(1927206001MS)				MS	3		E6850Q413Q	5311		10/3/2019	
8	675451	LH18/24-SP65...(1927206001MSD)				MSD	3		E6850Q413Q	5311		10/3/2019	
9	1927207001	16WW14-190916				SAMPLE	3	1927207001-A	E6850Q41.3	5480	10/14/2019	10/3/2019	
10	1927207002	16WW16-190916				SAMPLE	3	1927207002-A	E6850Q41.3	5480	10/14/2019	10/3/2019	
11	1927207003	16WW36-190916				SAMPLE	3	1927207003-A	E6850Q41.3	5480	10/14/2019	10/3/2019	
12	1927207004	16WW42-190916				SAMPLE	3	1927207004-A	E6850Q41.3	5480	10/14/2019	10/3/2019	
13	1927207005	16WW22-190917				SAMPLE	3	1927207005-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
14	1927207006	16WW41-190917				SAMPLE	3	1927207006-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
15	1927207007	16WW39-190917				SAMPLE	3	1927207007-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
16	1927207008	16WW56-190917				SAMPLE	3	1927207008-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
17	1927207009	16WW40-190917				SAMPLE	3	1927207009-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
18	675452	CCV for HBN 248518 [ELMS/2294]				CCV	3		E685041C3Q	5311		10/3/2019	
19	1927207010	16WW55-190917				SAMPLE	3	1927207010-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
20	1927207011	16WW43-190917				SAMPLE	3	1927207011-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
21	1927207012	16WW23-190917				SAMPLE	3	1927207012-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
22	1927207013	16WW24-190917				SAMPLE	3	1927207013-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
23	1927207014	16WW27-190917				SAMPLE	3	1927207014-A	E6850Q41.3	5480	10/15/2019	10/3/2019	
24	675453	CCV for HBN 248518 [ELMS/2294]				CCV	3		E685041C3Q	5311		10/3/2019	

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Analytical Documentation

Analyst Write-up

ALS Work Order #'s & Sample #( )'s: 1927206 (001); 1927207 (001-14)
ELMS Batch/HBN ID: 2294 (248518)
Prep Date: 09/24/2019 Analysis Date: 09/25/2019 Analyst: T. Bosch
Analyte: **Perchlorate** Matrix: **Water** Method: **6850**
Sequence: \\HPCHEM\1\SEQUENCE\CLO4\2019\SEP\25SEP19D.s
Reported DL: **1.0µg/L** Reported LOD: **2.0µg/L** Reported LOQ: **4.0µg/L**

SAMPLE PREPARATION/ANALYSIS:

Water: Samples were prepared by Thomas Bosch. 10.0mL of each sample was pipetted into a 15-mL centrifuge tube, and 50µL of an oxygen-18 labeled perchlorate solution was added as an internal standard. The samples were capped, vortexed, and filtered with Phenex PES membrane 0.45µm Syringe filters prior to analysis.

REAGENTS: Eluent A1: 95% ASTM Type II water (ALS)/5%ACN (B&J Lot DU461-US)/0.1% glacial acetic acid (JT-Baker Lot 122550).
Eluent B1: 95% ACN (B&J Lot DU461-US)/5% ASTM Type II water (ALS)/0.1% glacial acetic acid (JT-Baker Lot 122550).

STANDARDS: Internal Standard Spiking Solution Horizon# 47863. Dilutions of Working Standards (Horizon: 49947/48) used for ICAL, CCV's, RLVS and ICS.

CALIBRATION CURVE: Used curve from 09/20/2019, sequence 20SEP19D.s Offline Quantitation Method: CLO4-DP3.M

INSTRUMENT CONDITIONS: Samples were analyzed with an Agilent 1100 LC/MSD system, in negative SIM mode, monitoring m/z 83, 85, and 89.
Instrument ID: LCMS04 Online Acquisition Method: CLO4-AQN.M Fragmentor: 160 Output Gain: 8 Injection Volume: 30µL
Column: KP-RPPX C8 separator, 250mm Mobile Phase: 70% Eluent A1; 30% Eluent B1 Run time: 12.0min.

FLOW GRADIENT:

Time (min.)	Flow (mL/min)
0	0.65
5.8	0.65
5.9	0.25
10.3	0.25
10.5	0.65
12.0	0.65

QC DATA: 3.0µL of QC Solution Horizon ID 47516 was used for LCS 675449; Target = 3.0µg/L. ASTM type II water was used for LMB 675448.

MS/MSD: The Matrix Spike and duplicate (MS/MSD) were performed on sample 1927206001 (Client ID: LH18/24-SP650_091719_AIX). 3.0µl of Working Standard Solution Horizon ID 49947 was added to 10.0mL of sample preparation. Spike target = 3.0µg/L.

COMMENTS:

1) Results reported in µg/L.
2) All QC, Blank, CCV, and MS/MSD results were within method parameters. Field samples 1927207002/07/10 were analyzed and reported from 1:10 dilutions. The reporting limits have been adjusted accordingly. Field samples 1927207006/09 had positive results for perchlorate. However, because the 83/85 ion ratio failed, these results were not reported.
3) Sample data can be viewed at two directories within the ALS system: \\ALSLTWS013\LCMS\LCMS04\2019\SEP\HBN# or through NuGenesis\Tree\PrintData\LCMS\DefaultView.
4) Notebook: \\alsltws013\ORGANIC\BOSCH\LCMS\Perchlorates\Waters\2019\248518-DoD-ALS-Hstn LCMS4 or through \\ALSLTWS013\DATAREVIEW\HBN#
5) The Reporting Limit Verification Standard (RLVS – 675446) is reported from the analysis of the Laboratory Control Sample (LCS – 675449) at a level of 3.0µg/L.
6) Due to limitations of the Chemstation Software, some of the chromatographic peaks require manual integration. Manual Integrations were performed for one of the Initial Calibration analyses (datafile: 20SEPI03) along with datafiles 25SEPD13/23.

5.5 Chromatography (GC, HPLC and LC/MS) Technical Review

Note: It is the peer reviewer's responsibility to ensure that appropriate criteria are used as defined in the HORIZON PROFILE. The evaluation criteria are prioritized as per Section 2.2 of this SOP. These items must be checked for all projects. The following checklist will be completed by both the analyst and the peer reviewer and scanned into the HBN folder with the raw data.

Chromatography (GC, HPLC, LC/MS) Technical Review Criteria **Batch(es)/SDG:** ELMS. 2294 HBN: 248518 **Sample Set IDs if Applicable:** WO's 1927206/1927207	**Analyst Initials**	**Reviewer Initials**
Sample positions on autosampler verified against instrument sequence	TB	NA
Calibration standards analyzed and meets criteria	TB	SB
Standards traceability checked and meets criteria	TB	SB
Standard curve coefficients evaluated and meet criteria	TB	SB
ICVs analyzed and meet acceptance criteria	TB	SB
CCVs analyzed and meet acceptance criteria	TB	SB
Retention Time Windows checked	TB	SB
For method 8081A, Endrin/DDT Breakdown is checked for compliance	—	—
Surrogate recoveries checked and appropriately addressed	—	—
Method Preparation Blanks analyzed and meet acceptance criteria	TB	SB
MSs, MSDs, and/or MDs analyzed and calculations checked; applicable	TB	SB
RLVS analyzed	TB	SB
Preparation and analysis hold times met	TB	SB
Preparation deviations and re-preparations noted when performed	TB	SB
Analysis deviations and re-analyses noted when performed	TB	SB
Sample dilution factors noted on reports	TB	SB
Electronic records in HBN transcription accuracy and completeness	TB	SB
Preparation and analysis calculations checked	TB	SB
NCRs are completed as necessary NC/CAR#_____	TB	SB
Report forms are complete and accurate	TB	SB
Manual integrations checked	TB	SB

STANDARD REPORT

Working Standard - CLO4ISTDWRK

CLO4ISTDWRK — **Description - Perchlorate ISTD Wrk 1,000ug/L**

Standard:	**49946**	**Created By:**	Thomas Bosch	**Amount:**	25 mL
MFG:	ALS/SLC	**Create Date:**	09/23/2019 03:09PM	**Expires:**	09/19/2020
MFG Lot:	TNB: 09/20/2019	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Pipette ID:	Not Provided	**Verify Date:**		**Lab Lot:**	CLO4ISTDWRK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/L
2	14797-73-0-89	Perchlorate 89	1000 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
47863	CLO4ISTDSTK	Perchlorate ISTD Stock	CLO4ISTDSTK	0.25 mL	12/05/2028

STANDARD REPORT

Constituent

Stock Standard - CLO4ISTDSTK

CLO4ISTDSTK — **Description - Perchlorate ISTD Stock**

Standard:	**47863**	**Created By:**	Thomas Bosch	**Amount:**	1 mL
MFG:	Cambridge Isotope	**Create Date:**	05/23/2019 10:05AM	**Expires:**	12/05/2028
MFG Lot:	SDIH-016	**Verified By:**	Thomas Bosch	**Usable:**	Yes
Part ID:	OLM-7310-S	**Verify Date:**		**Lab Lot:**	CLO4ISTDSTK

Pos.	Analyte	Name	Concentration
1	14797-73-0-8385	Perchlorate 83:85 Ratio	100 ug/mL
2	14797-73-0-89	Perchlorate 89	100 ug/mL

STANDARD REPORT

Working Standard - CLO4 WRK

CLO4 WRK — **Description - 6850 WKG Std 100.ug/L**

Standard: 49948
MFG: ALS/SLC
MFG Lot: TNB: 09/20/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/20/2019 03:09PM

Amount: 10 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 WRK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	0.1 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	0.1 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
49947	CLO4 INT	6850 Intermdt AccStd 10.ug/mL	CLO4 INT	0.1 mL	07/25/2020

STANDARD REPORT

Constituent

Stock Standard - CLO4 STOCK

CLO4 STOCK — **Description - 6850 Stock AccStd 1,000ug/mL**

Standard: 43659
MFG: AccuStandard
MFG Lot: 218065075
Part ID: IC-PER-10X-1

Created By: Thomas Bosch
Create Date: 09/17/2018 09:09AM

Amount: 100 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	1000 ug/mL

STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O			Description - ASTM Type II Water
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L	
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025	
MFG Lot: Not Provided		**Usable:** Yes	
Part ID: Not Provided		**Lab Lot:** LAB 109	

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

STANDARD REPORT

Constituent

Working Standard - CLO4 INT

CLO4 INT — **Description - 6850 Intermdt AccStd 10.ug/mL**

Standard: 49947
MFG: ALS/SLC
MFG Lot: TNB: 09/20/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 09/23/2019 03:09PM

Amount: 10 mL
Expires: 07/25/2020
Usable: Yes
Lab Lot: CLO4 INT

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL
2	14797-73-0-8385	Perchlorate 83:85 Ratio	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
43659	CLO4 STOCK	6850 Stock AccStd 1,000ug/mL	CLO4 STOCK	0.1 mL	07/25/2020

STANDARD REPORT

Working Standard - CLO4 QC WRK

CLO4 QC WRK — **Description - 6850 QC WKG STD 100ug/L**

Standard: 47516
MFG: ALS/SLC
MFG Lot: TNB: 05/06/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/06/2019 03:05PM

Amount: 10 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC WRK 100.ug/L

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	100 ug/L

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
47515	CLO4 QC INT	6850 QC Intrmdt Std-QC 10ug/mL	CLO4 QC INT 10.ug/mL	0.1 mL	03/31/2020

STANDARD REPORT

Constituent

Solvent Standard - ASTM H2O

ASTM H2O			Description - ASTM Type II Water
Standard: 109	**Created By:** ALS Support (Lims)	**Amount:** 1000 L	
MFG: DCL In House	**Create Date:** 10/06/2005 09:10AM	**Expires:** 11/07/2025	
MFG Lot: Not Provided		**Usable:** Yes	
Part ID: Not Provided		**Lab Lot:** LAB 109	

Pos.	Analyte	Name	Concentration
Solvent - Analyte(s) not applicable			

STANDARD REPORT

Constituent

Stock Standard - CLO4 QCSTOCK

CLO4 QCSTOCK — **Description - 6850 QC Stock STD 1,000ug/mL**

Standard: 36748
MFG: Ultra Scientific
MFG Lot: CP-0860
Part ID: ICC-013

Created By: Thomas Bosch
Create Date: 05/11/2017 01:05PM

Amount: 100 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC STOCK

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	1000 ug/mL

STANDARD REPORT

Constituent

Working Standard - CLO4 QC INT

CLO4 QC INT — **Description - 6850 QC Intrmdt Std-QC 10ug/mL**

Standard: 47515
MFG: ALS/SLC
MFG Lot: TNB: 05/06/2019
Pipette ID: Not Provided

Created By: Thomas Bosch
Create Date: 05/06/2019 03:05PM

Amount: 10 mL
Expires: 03/31/2020
Usable: Yes
Lab Lot: CLO4 QC INT 10.ug/mL

Pos.	Analyte	Name	Concentration
1	14797-73-0	Perchlorate	10 ug/mL

Composition

Standard	Standard ID	Description	Lab Lot ID	Volume	Expires
109	ASTM H2O	ASTM Type II Water	LAB 109	9.9 mL	11/07/2025
36748	CLO4 QCSTOCK	6850 QC Stock STD 1,000ug/mL	CLO4 QC STOCK	0.1 mL	03/31/2020

01029828

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CERTIFICATE OF ANALYSIS

S 43659

AccuTrace™ Reference Standard

Catalog No: IC-PER-10X-1
Description: Perchlorate Standard
Element: Perchlorate (ClO_4)
SRM: Ind. Std.
Lot: 218065075
Matrix: Water
Hazards: *Refer to SDS for complete safety information*

Signal Word: None

Date Certified: Jun 25, 2018
Expiration: Jul 25, 2020
Sample Size: 100 mL
Components: 1
Storage Condition: Ambient (>5 °C)
Included on ISO/IEC 17025 Scope of Accreditation: Yes
Included on ISO 17034 Scope of Accreditation: Yes

Component		SRM #	Prepared Concentration (µg/mL)
ClO_4	Perchlorate	Ind. Std.	1000

The gravimetric uncertainty for this product is ±0.24%.
The final solution was checked against an independent standard to verify its concentration.
We use the highest purity raw materials available to minimize impurity levels in the final solution. Typically 99.999%+ pure starting materials are used as well as ASTM Type I 18 megohm deionized water.
All solutions are filtered through a 0.2 µm filter prior to being bottled.
All glassware used in preparation is Class A and calibrated regularly.
All weights are traceable through NIST, Test No. 822-275872-11
All bottles are triple rinsed with deionized water prior to use.
Shake bottle prior to use and do not pipette directly out of the bottle. Use only cleaned Class A volumetric glassware.
We certify the accuracy of this standard to be ±0.5% of the stated value until its expiration date provided it is kept tightly capped and stored under the conditions stated above.

Certified By: Meigan O'Leary
Meigan O'Leary, Inorganic QC Manager

For use in routine laboratory analysis.

AccuStandard is accredited to ISO 17034, ISO/IEC 17025 and certified to ISO 9001:2015

QR-ORG/INO-001
Rev. 5/18

AccuStandard

ALS

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

TRIPLE ISO CERTIFICATION ULTRA ISO 17025 ISO GUIDE 34 ISO 9001

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

S 36748

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Product Name: Perchlorate IC Standard

Description:
This Reference Material (RM) was gravimetrically prepared in accordance with ISO Guide 34 and under ULTRA Scientific's ISO 9001 registered quality system. The neat materials used for this product have been verified by ULTRA's ISO 17025 laboratory and under ULTRA's ISO Guide 34 accreditation. The analyte concentrations were verified by ULTRA's ISO 17025 accredited laboratory. For each analyte, the true value, with its uncertainty value calculated at the 95% confidence level, is reported below.

Analyte	Starting Material	Lot Number	Purity (%)	Calculated Value	True Value	Traceability & Method
perchlorate	potassium perchlorate	RM07987	100	1001 ± 5 µg/mL	976 ± 6 µg/mL	NIST SRM 3141A; ICP-OES

Solvent: water (low TOC, < 50 ppb)

Storage: Store at Room Temperature (15° to 30°C).

Traceability:
Traceability has been established through an unbroken chain of comparisons, each having stated uncertainties. Comparisons are based on appropriate physical or chemical measurements, including gravimetric or volumetric dilution, where the mass or volume of a solution before and after dilution is measured. The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1, ISO 9001, ISO 17025, and ISO Guide 34. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 819.

Estimation of Uncertainties:
The true value is reported, with its uncertainty value calculated at the 95% confidence level.

Homogeneity:
This RM was formulated and unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:
This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods and continuing calibration verification.

Instructions for Use:
Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening and should be processed without delay for the true value to be valid within the stated uncertainties. Do not pipet from the bottle. Do not return any material removed for pipetting to the bottle. Tightly cap the bottle after removing any material and store according to the instructions noted above.

Hazards:
Refer to the Safety Data Sheet for information regarding this RM.

Expiration of Certification:
The certification of this RM is valid, within the measurement uncertainty specified, until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO 17025 TESTING LABORATORY

ISO 9001 Registered Quality System – TUV USA

ALS
250 SMITH STREET • NORTH KINGSTOWN, RHODE ISLAND 02852 • WWW.ULTRASCI.COM

ULTRA SCIENTIFIC
Analytical Solutions

Certificate of Analysis

TRIPLE ISO CERTIFICATION ULTRA ISO 17025 • ISO GUIDE 34 • ISO 9001

ISO Guide 34 Reference Material

Product Number: ICC-013
Lot Number: CP-0860

Lot Issue Date: 29-Feb 2016
Expiration Date: 31-Mar 2020

Maintenance of Certification:
The real-time, long term stability of the RM may be monitored over the lifetime of the certification. If substantive changes occur that affect the certification before the expiration of this certificate, ULTRA Scientific will notify the purchaser.

Peter A. King, Ph.D.
VP, Technical Operations

Daniel J. Lamendola
Director of QA/RA

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ISO 9001 Registered Quality System – TUV USA

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Cambridge Isotope Laboratories, Inc.

Certificate of Analysis

S 47863

Product Name: (Isotopic Label & Enrichment Specification) PERCHLORIC ACID, SODIUM SALT (18O4, 90%+) 100 UG/ML IN WATER

Lot Number: SDIH-016

Catalog Number: OLM-7310-S

Product Information

Chemical Purity Specification:	≥98%
MW*: * *For isotopically labeled compounds, MW listed is for the fully enriched product.*	130.44
Labeled CAS Number:	NA
Unlabeled CAS Number:	7601-89-0
Chemical Formula:	NaCl*O4
Storage:	Store at room temperature away from light and moisture.
Stability:	See storage and expiration date.

$NaCl^{18}O_4$

Certification

Cambridge Isotope Laboratories, Inc. guarantees that this material meets or exceeds the specifications stated. Absolute identity as well as chemical and isotopic purities are assured by the use of unambiguous synthetic routes and multiple chemical analyses whenever possible. Results are representative of QC testing at time of release from Quality Control unless otherwise stated. CIL Certificates of Analysis are occasionally updated with new data following recertification. We recommend checking the website for the latest version.

Volumetric measurements were made with Class A glassware. Gravimetry is traceable to the NIST through calibrated balances and certified, calibrated, standard weights. The calibrations are traceable to the NIST under Test No. 822/270236-04. The calibrations also meet specifications outlined in ISO 9001, ISO/IEC 17025, ANSI/NSCL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable subdocuments.

This COA references the bulk catalog number before packaging. The COA also applies to the CIL finished good catalog number . Some possible packaging sizes and their corresponding suffix are -1.2, -1, -0.5, -10, or -0.1.

Approved by: Sashi Sivendran-Basak

Sashi Sivendran-Basak, Ph.D., Quality Review

Quality Control Tests and Results

QC Release Date	12/05/2018
Expiration Date	12/05/2028
Concentration Based on Gravimetry	100.0 ± 1.0 µg/mL (k=2)
Chemical Purity of Neat Material(s)	98%
LC/MS for Concentration	105.4 ± 1.1 µg/mL (k=2)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

Batch Report: C:\HPCHEM\1\DATA\25SEP19D\25SEP19S.B

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP3.M

['#' ==> Run has not been reprocessed with Batch Review Method
'*' ==> Run has been saved with batch file]

#*	Sample	Location	Inj	SampleType	Run	Perchlorate Area	Perchlorat RT	Perchlorate Amount	
*	675445 CCV@25	Vial 71	1	Control	1	1.52149e6	7.621	25.90224	
*	675449 QC@3.0	Vial 72	1	Control	2	2.08955e5	7.664	3.01179	
*	675447 ICS@3.0	Vial 73	1	Control	3	1.50319e5	7.482	2.88825	
*	675448 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000	
*	1927206001	Vial 75	1	Sample	5	0.00000	0.000	0.00000	
*	675450 272061S	Vial 76	1	Sample	6	1.39320e5	7.385	2.80679	
*	675451 272061D	Vial 77	1	Sample	7	1.44537e5	7.383	2.85574	
*	1927207001	Vial 78	1	Sample	8	0.00000	0.000	0.00000	
*	1927207002 10X	Vial 79	1	Sample	9	2.98854e6	7.478	460.20446	
*	1927207003	Vial 80	1	Sample	10	0.00000	0.000	0.00000	
*	1927207004	Vial 81	1	Sample	11	0.00000	0.000	0.00000	
*	1927207005	Vial 82	1	Sample	12	0.00000	0.000	0.00000	
*	1927207006	Vial 83	1	Sample	13	1.88187e6	6.100	~~31.07390~~	N.R.
*	1927207007 10X	Vial 84	1	Sample	14	6.93117e5	7.335	133.87397	
*	1927207008	Vial 85	1	Sample	15	0.00000	0.000	0.00000	
*	1927207009	Vial 86	1	Sample	16	1.11064e5	6.770	~~2.02579~~	N.R.
*	675452 CCV@25	Vial 71	1	Control	17	1.27962e6	7.772	24.90310	
*	1927207010 10X	Vial 87	1	Sample	18	2.74935e6	7.426	477.50326	
*	1927207011	Vial 88	1	Sample	19	0.00000	0.000	0.00000	
*	1927207012	Vial 89	1	Sample	20	0.00000	0.000	0.00000	
*	1927207013	Vial 90	1	Sample	21	0.00000	0.000	0.00000	
*	1927207014	Vial 91	1	Sample	22	0.00000	0.000	0.00000	
*	1927207006 MS-25	Vial 61	1	Sample	23	2.73287e6	6.121	46.55394	
*	675453 CCV@25	Vial 71	1	Control	24	1.22155e6	7.794	25.00337	

N.R. · NOT REPORTED / FAILS 83/85 ION RATIO. TB 9.26.19

#*	Sample	Location	Inj	SampleType	Run	CLO4-89-ISTD Area	CLO4-89-IS RT	CLO4-89-ISTD Amount
*	675445 CCV@25	Vial 71	1	Control	1	1.99964e5	7.645	5.00000
*	675449 QC@3.0	Vial 72	1	Control	2	2.55289e5	7.691	5.00000
*	675447 ICS@3.0	Vial 73	1	Control	3	1.91396e5	7.499	5.00000
*	675448 LMB	Vial 74	1	Control	4	2.07016e5	7.793	5.00000
*	1927206001	Vial 75	1	Sample	5	1.87714e5	7.354	5.00000
*	675450 272061S	Vial 76	1	Sample	6	1.82459e5	7.412	5.00000
*	675451 272061D	Vial 77	1	Sample	7	1.86097e5	7.399	5.00000
*	1927207001	Vial 78	1	Sample	8	1.65317e5	7.285	5.00000
*	1927207002 10X	Vial 79	1	Sample	9	2.03978e5	7.497	50.00000
*	1927207003	Vial 80	1	Sample	10	1.67627e5	6.803	5.00000
*	1927207004	Vial 81	1	Sample	11	1.77077e5	7.239	5.00000
*	1927207005	Vial 82	1	Sample	12	1.82948e5	7.234	5.00000
*	1927207006	Vial 83	1	Sample	13	2.01848e5	6.105	5.00000
*	1927207007 10X	Vial 84	1	Sample	14	1.85568e5	7.362	50.00000
*	1927207008	Vial 85	1	Sample	15	1.84103e5	7.282	5.00000
*	1927207009	Vial 86	1	Sample	16	2.00027e5	6.810	5.00000
*	675452 CCV@25	Vial 71	1	Control	17	1.75644e5	7.785	5.00000
*	1927207010 10X	Vial 87	1	Sample	18	1.79651e5	7.448	50.00000
*	1927207011	Vial 88	1	Sample	19	1.92432e5	7.645	5.00000
*	1927207012	Vial 89	1	Sample	20	1.72716e5	7.183	5.00000
*	1927207013	Vial 90	1	Sample	21	1.74006e5	7.201	5.00000
*	1927207014	Vial 91	1	Sample	22	1.67770e5	7.044	5.00000
*	1927207006 MS-25	Vial 61	1	Sample	23	1.84010e5	6.106	5.00000
*	675453 CCV@25	Vial 71	1	Control	24	1.66933e5	7.808	5.00000

#*	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
*	675445 CCV@25	Vial 71	1	Control	1	4.75826e5	7.629	26.51372
*	675449 QC@3.0	Vial 72	1	Control	2	6.60079e4	7.698	3.02994
*	675447 ICS@3.0	Vial 73	1	Control	3	5.41931e4	7.494	3.32936
*	675448 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000

Batch Report: C:\HPCHEM\1\DATA\25SEP19D\25SEP19S.B

#*	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
*	1927206001	Vial 75	1	Sample	5	0.00000	0.000	0.00000
*	675450 272061S	Vial 76	1	Sample	6	4.84273e4	7.404	3.11348
*	675451 272061D	Vial 77	1	Sample	7	4.86841e4	7.381	3.06706
*	1927207001	Vial 78	1	Sample	8	0.00000	0.000	0.00000
*	1927207002 10X	Vial 79	1	Sample	9	8.89517e5	7.494	453.30278
*	1927207003	Vial 80	1	Sample	10	0.00000	0.000	0.00000
*	1927207004	Vial 81	1	Sample	11	0.00000	0.000	0.00000
*	1927207005	Vial 82	1	Sample	12	0.00000	0.000	0.00000
*	1927207006	Vial 83	1	Sample	13	4.80235e5	6.116	26.51007
*	1927207007 10X	Vial 84	1	Sample	14	2.18926e5	7.354	137.66095
*	1927207008	Vial 85	1	Sample	15	0.00000	0.000	0.00000
*	1927207009	Vial 86	1	Sample	16	1.33981e4	6.772	6.69602e-1
*	675452 CCV@25	Vial 71	1	Control	17	3.93113e5	7.793	25.07225
*	1927207010 10X	Vial 87	1	Sample	18	8.19119e5	7.441	470.94700
*	1927207011	Vial 88	1	Sample	19	0.00000	0.000	0.00000
*	1927207012	Vial 89	1	Sample	20	0.00000	0.000	0.00000
*	1927207013	Vial 90	1	Sample	21	0.00000	0.000	0.00000
*	1927207014	Vial 91	1	Sample	22	0.00000	0.000	0.00000
*	1927207006 MS-25	Vial 61	1	Sample	23	7.47216e5	6.137	42.62658
*	675453 CCV@25	Vial 71	1	Control	24	3.69756e5	7.817	24.83520

*** End of Report ***

Sequence Table:

Method and Injection Info Part:

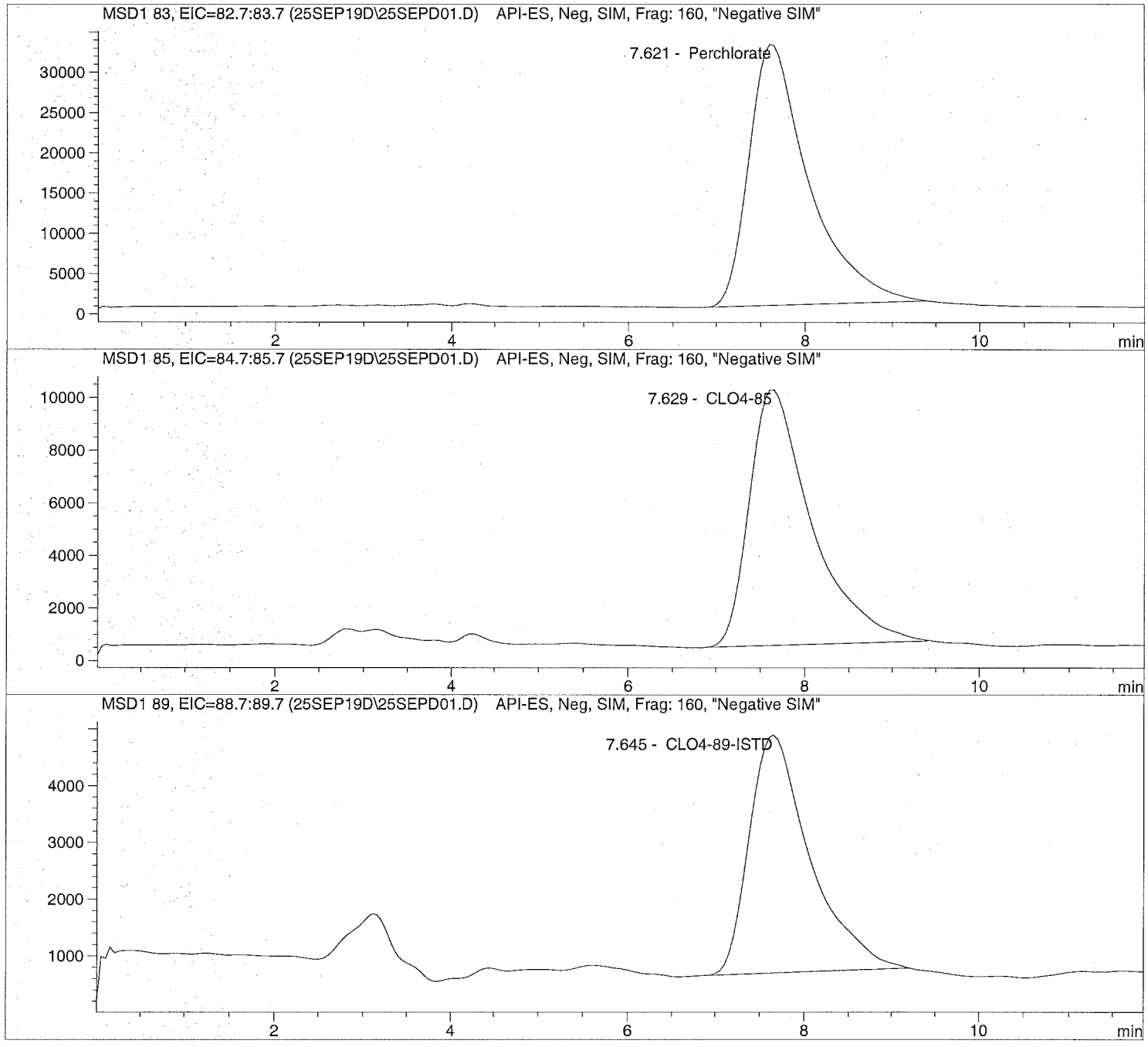
Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	675445 CCV@25	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	675449 QC@3.0	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	675447 ICS@3.0	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	675448 LMB	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	1927206001	CLO4-AQN	1	Sample		
6	Vial 76	675450 272061S	CLO4-AQN	1	Sample		
7	Vial 77	675451 272061D	CLO4-AQN	1	Sample		
8	Vial 78	1927207001	CLO4-AQN	1	Sample		
9	Vial 79	1927207002 10X	CLO4-AQN	1	Sample		
10	Vial 80	1927207003	CLO4-AQN	1	Sample		
11	Vial 81	1927207004	CLO4-AQN	1	Sample		
12	Vial 82	1927207005	CLO4-AQN	1	Sample		
13	Vial 83	1927207006	CLO4-AQN	1	Sample		
14	Vial 84	1927207007 10X	CLO4-AQN	1	Sample		
15	Vial 85	1927207008	CLO4-AQN	1	Sample		
16	Vial 86	1927207009	CLO4-AQN	1	Sample		
17	Vial 71	675452 CCV@25	CLO4-AQN	1	Ctrl Samp		
18	Vial 87	1927207010 10X	CLO4-AQN	1	Sample		
19	Vial 88	1927207011	CLO4-AQN	1	Sample		
20	Vial 89	1927207012	CLO4-AQN	1	Sample		
21	Vial 90	1927207013	CLO4-AQN	1	Sample		
22	Vial 91	1927207014	CLO4-AQN	1	Sample		
23	Vial 61	1927207006 MS-25	CLO4-AQN	1	Sample		
24	Vial 71	675453 CCV@25	CLO4-AQN	1	Ctrl Samp		

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD01.D Sample Name: 675445 CCV@25

Injection Date:	9/25/2019 08:33:38	Seq Line:	1
Sample Name:	675445 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD01.D Sample Name: 675445 CCV@25

Injection Date:	9/25/2019 08:33:38	Seq Line:	1
Sample Name:	675445 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.621	PBA	1521492.5	25.9022	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.629	PBA	475825.5	26.5137	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.645	PBA	199964.0	5.0000	CLO4-89-ISTD

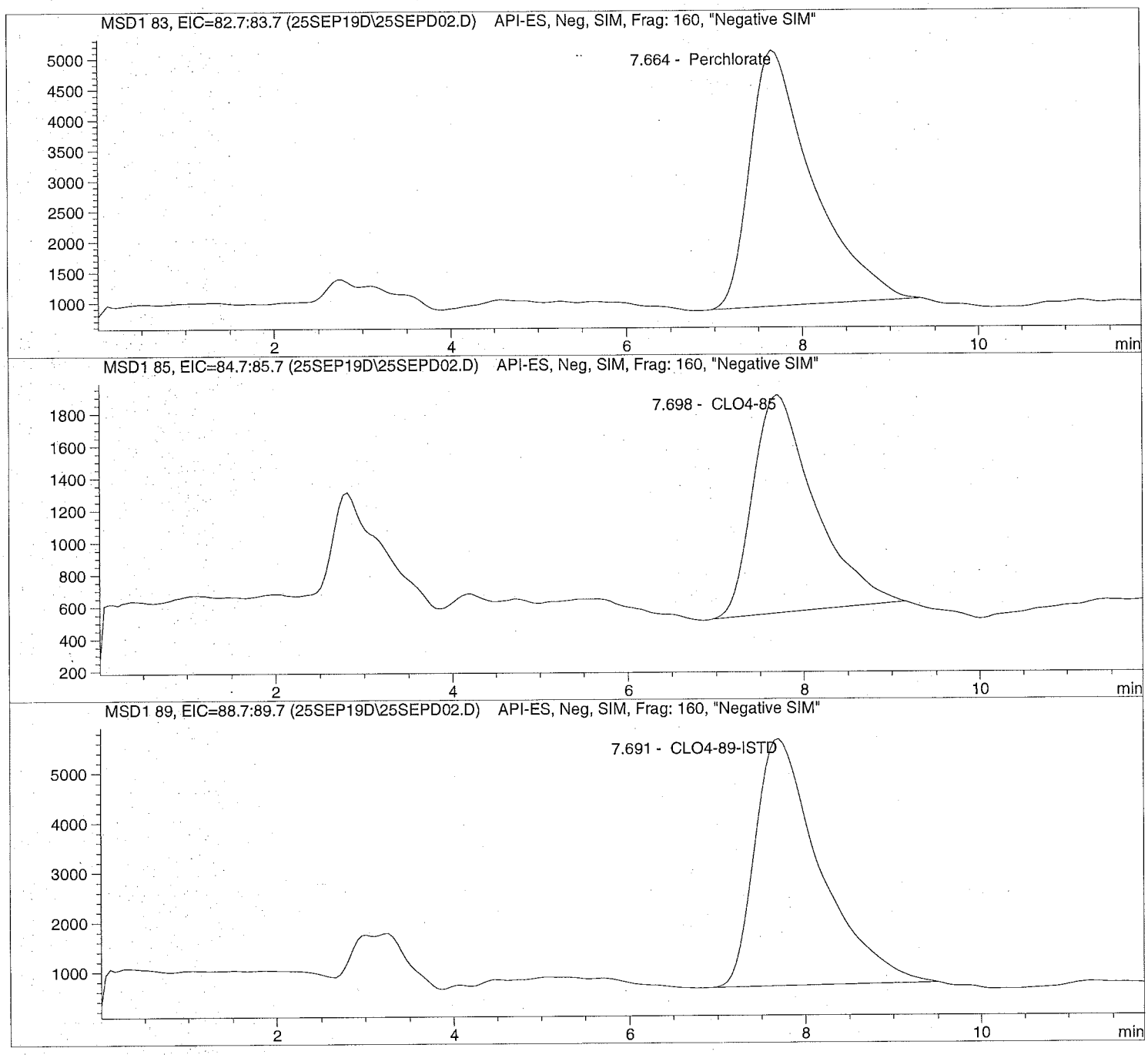
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD02.D Sample Name: 675449 QC@3.0

Injection Date:	9/25/2019 08:52:05	Seq Line:	2
Sample Name:	675449 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD02.D Sample Name: 675449 QC@3.0

Injection Date:	9/25/2019 08:52:05	Seq Line:	2
Sample Name:	675449 QC@3.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	3.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.664	PBA	208955.0	3.0118	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.698	PBA	66007.9	3.0299	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.691	PBA	255289.4	5.0000	CLO4-89-ISTD

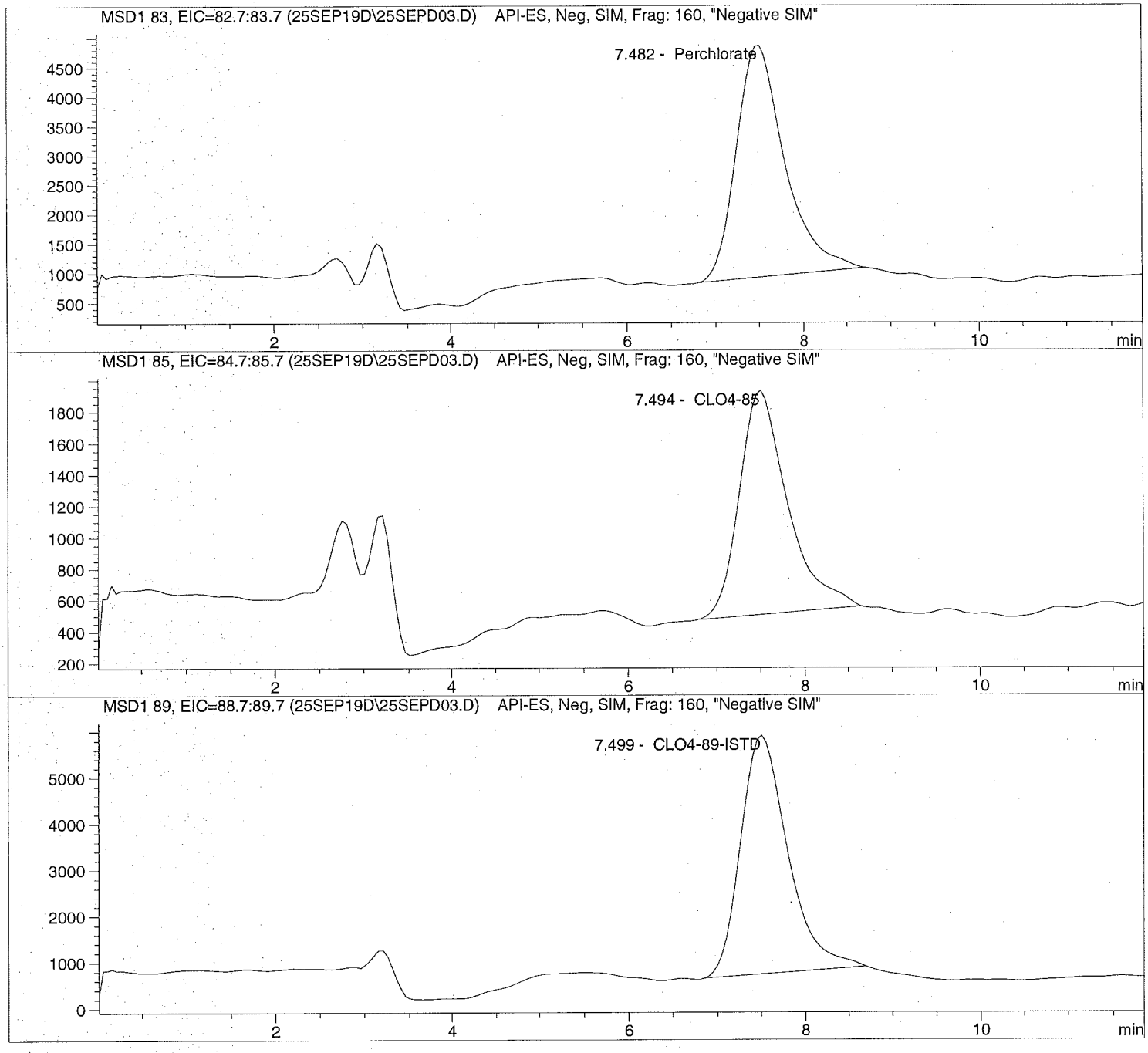
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD03.D Sample Name: 675447 ICS@3.0

Injection Date:	9/25/2019 09:05:53	Seq Line:	3
Sample Name:	675447 ICS@3.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD03.D Sample Name: 675447 ICS@3.0

Injection Date:	9/25/2019 09:05:53	Seq Line:	3
Sample Name:	675447 ICS@3.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	3.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.482	PBA	150319.5	2.8883	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.494	BBA	54193.1	3.3294	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.499	PBA	191395.7	5.0000	CLO4-89-ISTD

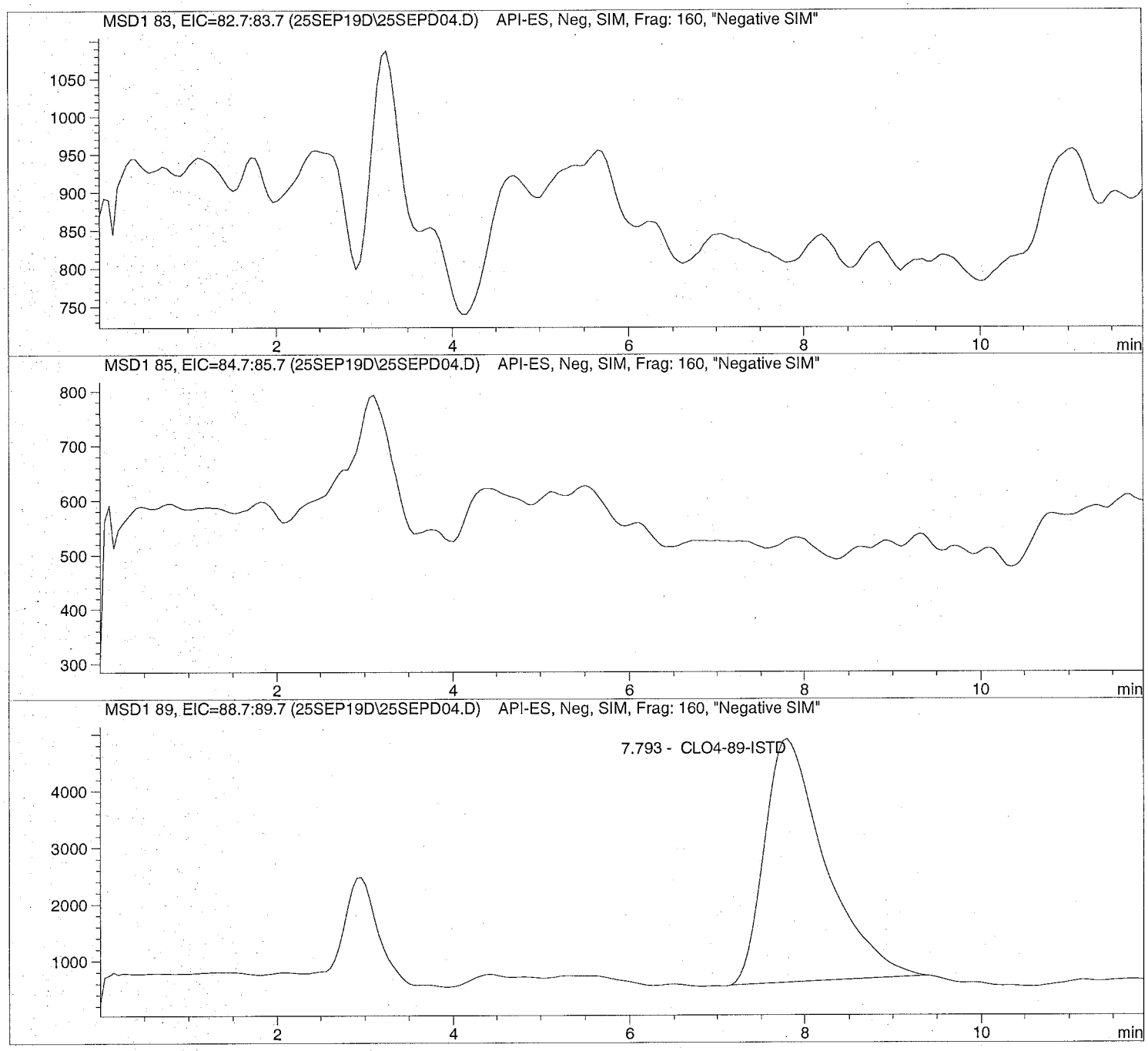
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD04.D Sample Name: 675448 LMB

Injection Date:	9/25/2019 09:19:44	Seq Line:	4
Sample Name:	675448 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD04.D Sample Name: 675448 LMB

Injection Date:	9/25/2019 09:19:44	Seq Line:	4
Sample Name:	675448 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	207016.0	5.0000	CLO4-89-ISTD

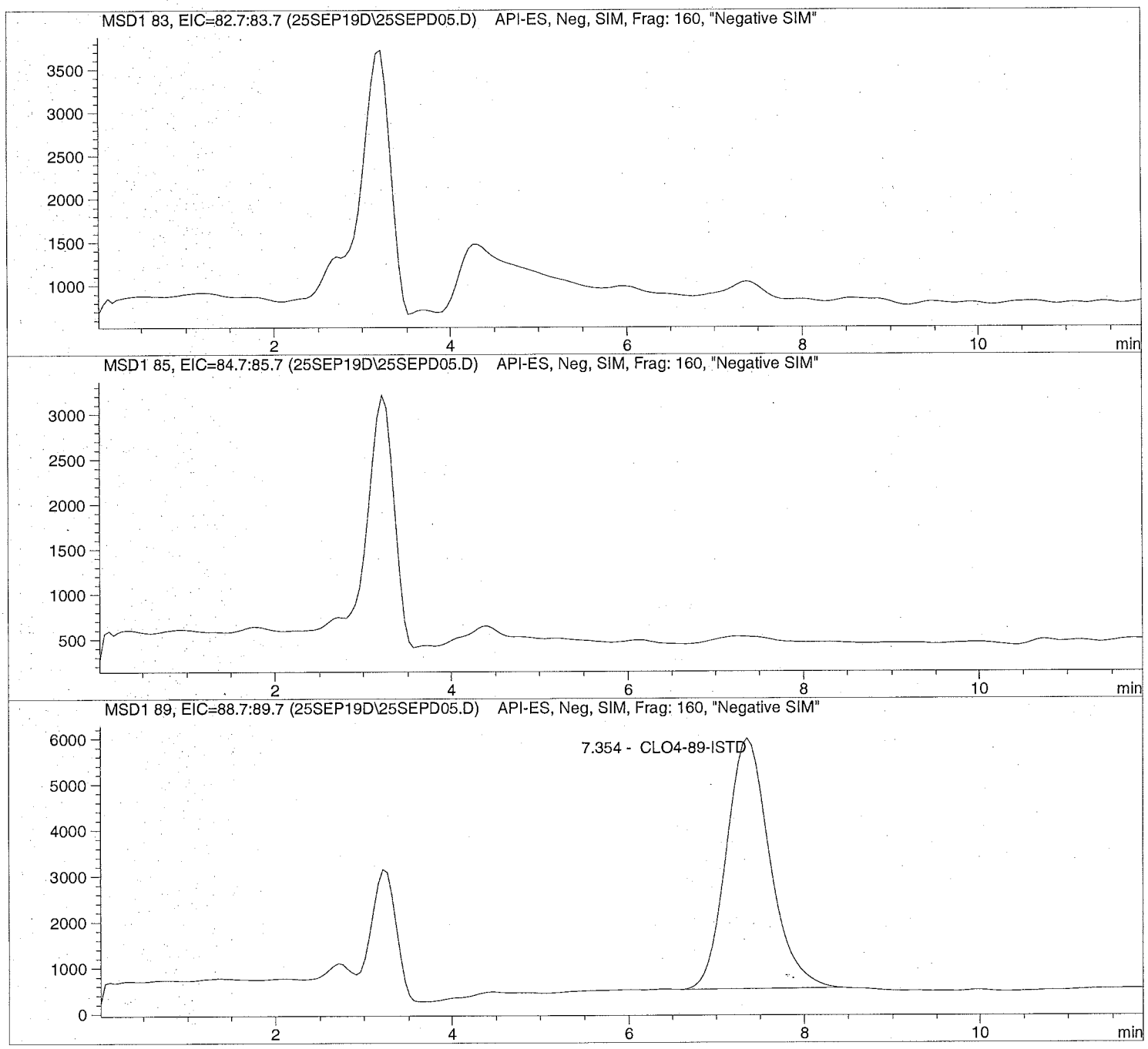
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD05.D Sample Name: 1927206001

Injection Date:	9/25/2019 09:33:36	Seq Line:	5
Sample Name:	1927206001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD05.D Sample Name: 1927206001

Injection Date:	9/25/2019 09:33:36	Seq Line:	5
Sample Name:	1927206001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.354	PBA	187714.1	5.0000	CLO4-89-ISTD

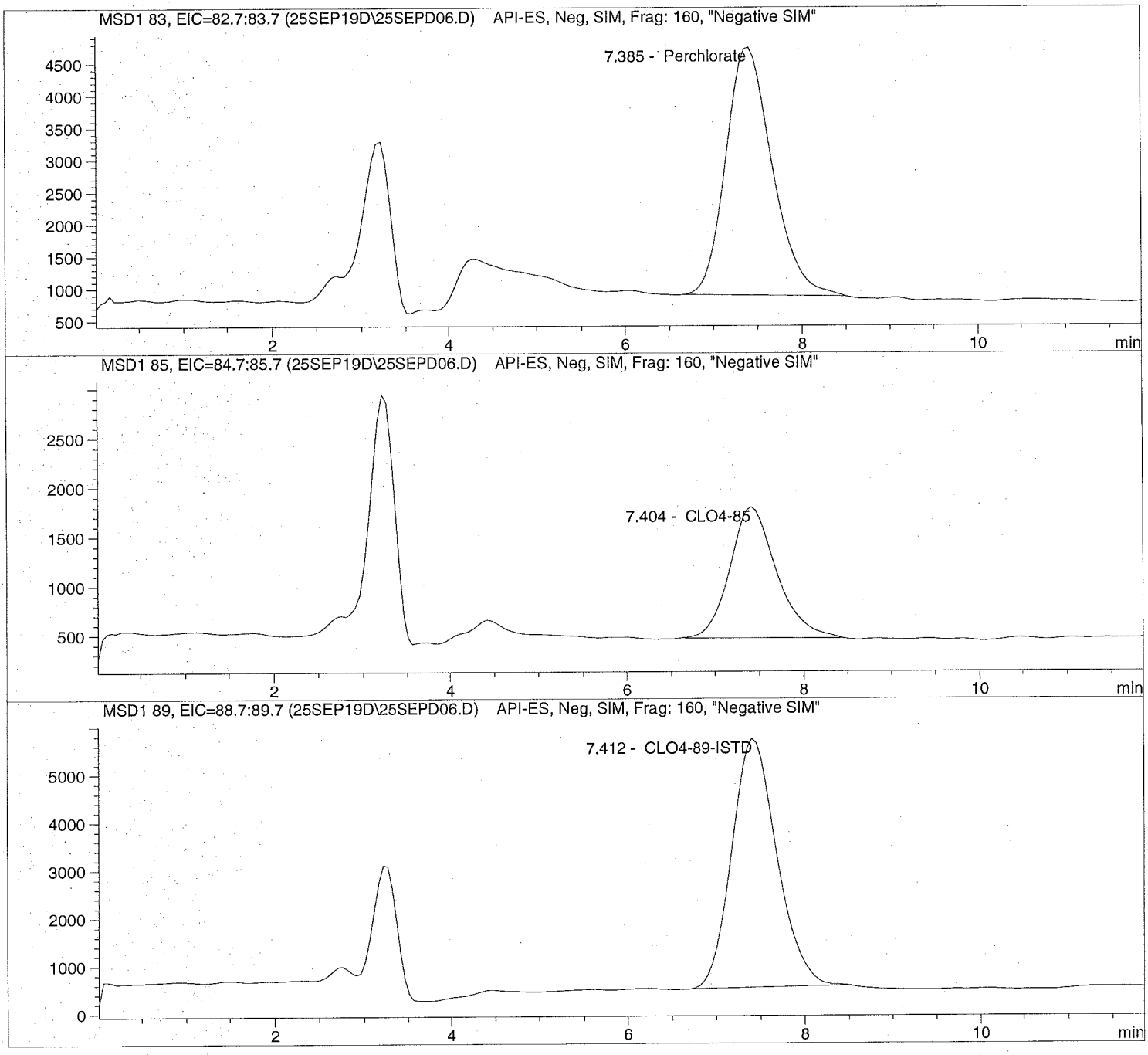
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD06.D Sample Name: 675450 272061S

Injection Date:	9/25/2019 09:47:24	Seq Line:	6
Sample Name:	675450 272061S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD06.D Sample Name: 675450 272061S

Injection Date:	9/25/2019 09:47:24	Seq Line:	6
Sample Name:	675450 272061S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.385	PBA	139320.0	2.8068	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.404	BBA	48427.3	3.1135	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.412	PBA	182458.8	5.0000	CLO4-89-ISTD

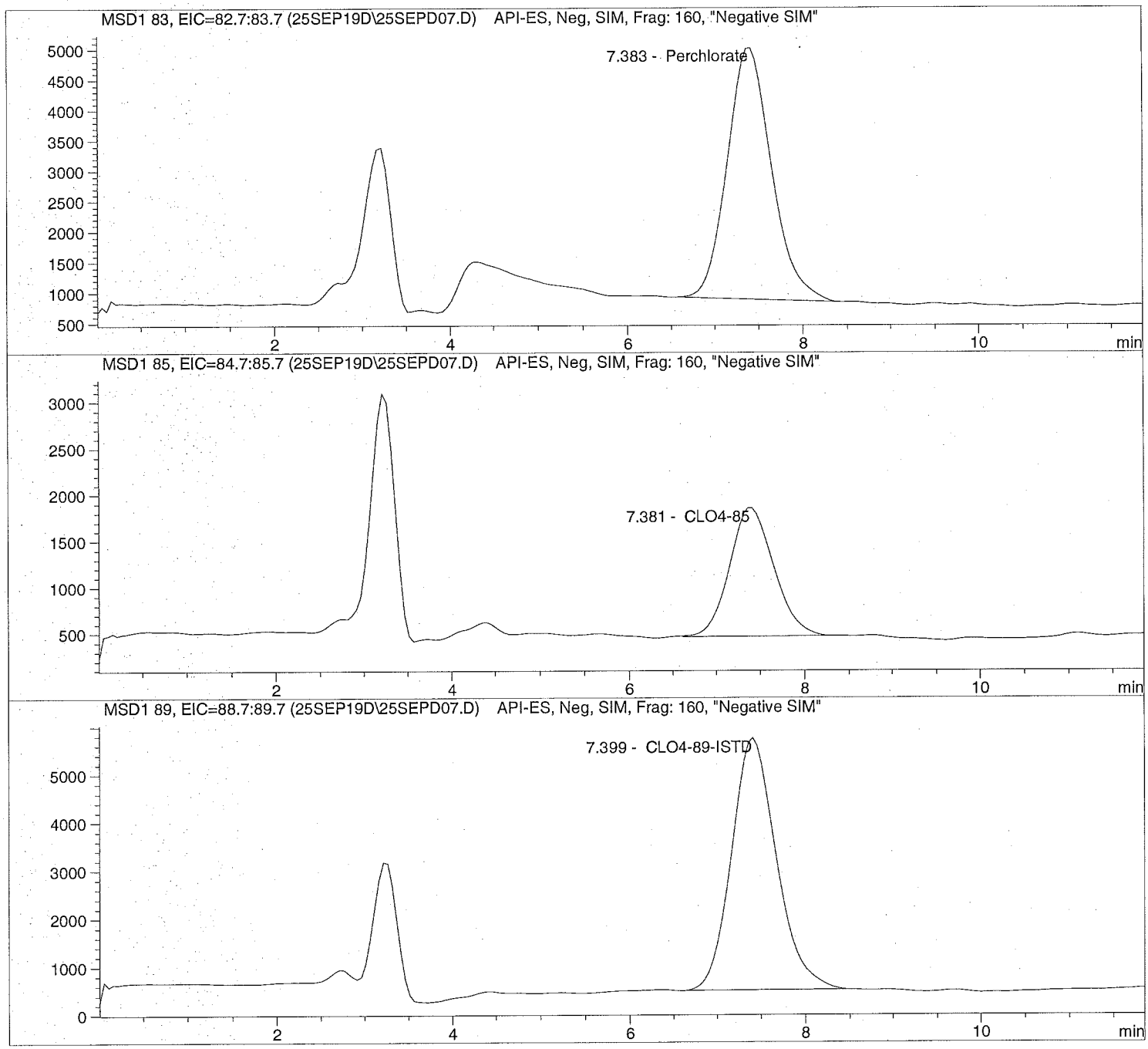
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD07.D Sample Name: 675451 272061D

Injection Date:	9/25/2019 10:01:16	Seq Line:	7
Sample Name:	675451 272061D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD07.D Sample Name: 675451 272061D

Injection Date:	9/25/2019 10:01:16	Seq Line:	7
Sample Name:	675451 272061D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.383	PBA	144537.4	2.8557	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.381	BBA	48684.1	3.0671	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.399	PBA	186097.0	5.0000	CLO4-89-ISTD

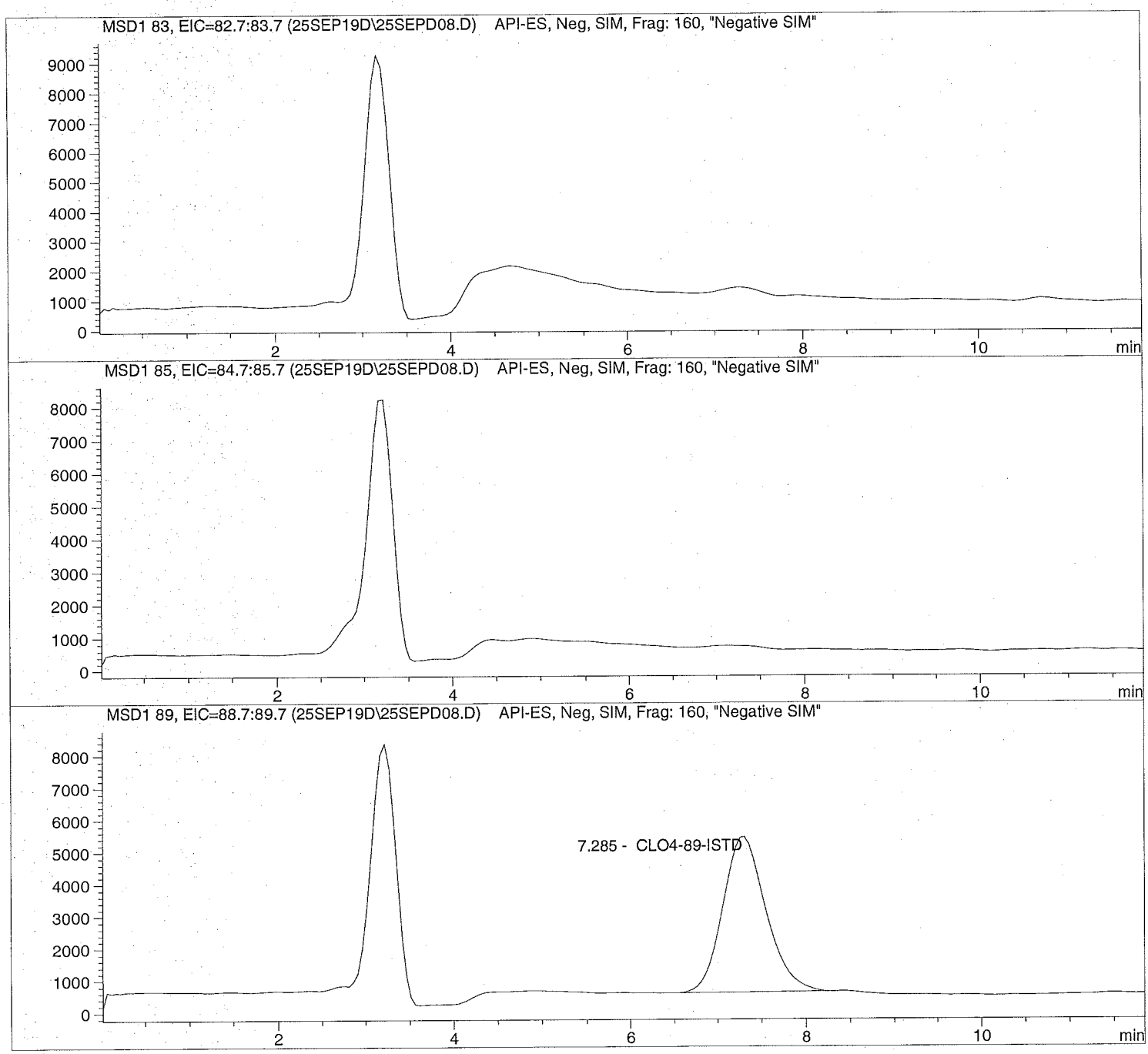
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD08.D Sample Name: 1927207001

Injection Date:	9/25/2019 10:15:04	Seq Line:	8
Sample Name:	1927207001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD08.D Sample Name: 1927207001

Injection Date:	9/25/2019 10:15:04	Seq Line:	8
Sample Name:	1927207001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.285	PBA	165317.4	5.0000	CLO4-89-ISTD

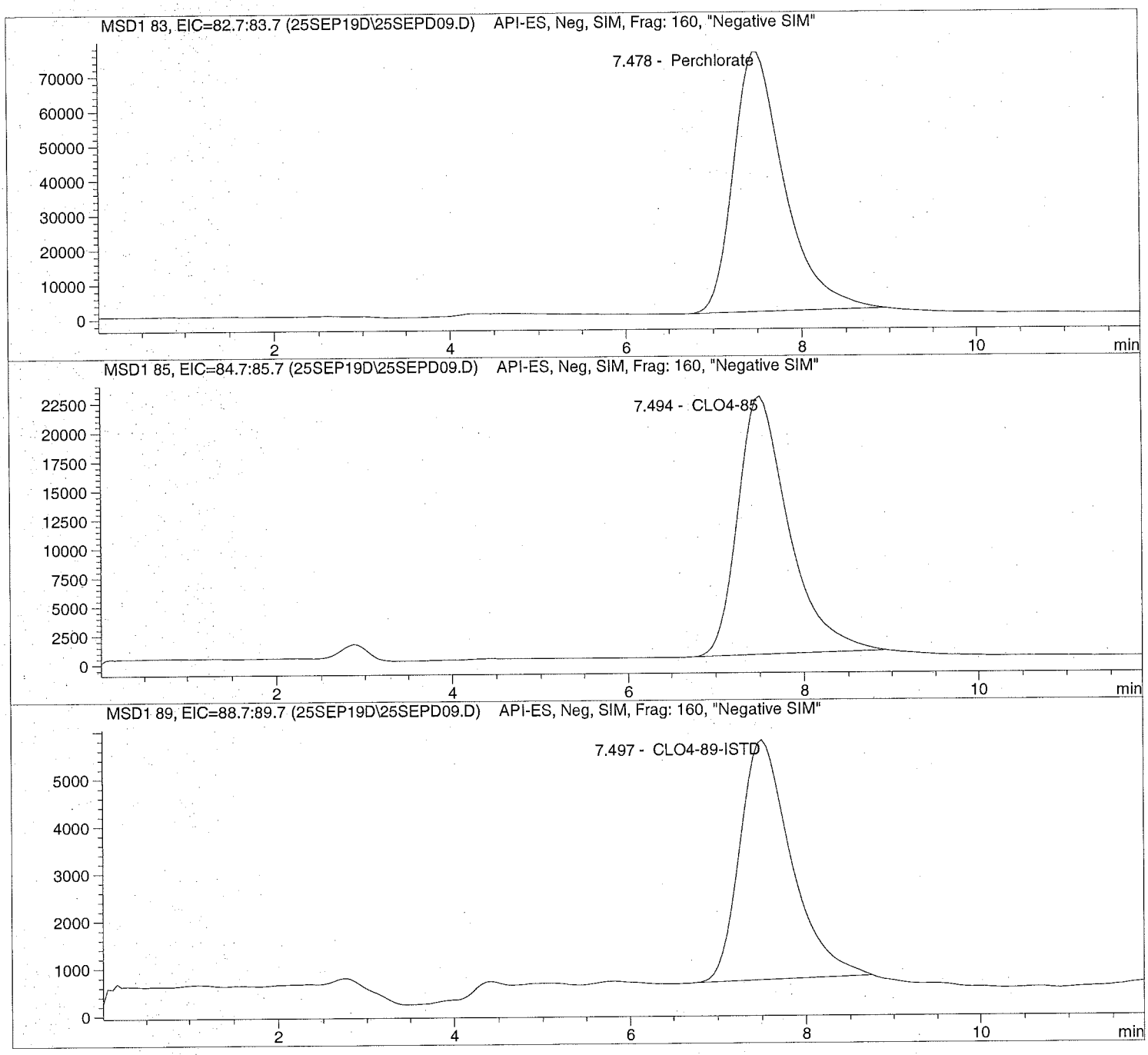
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD09.D Sample Name: 1927207002 10X

Injection Date:	9/25/2019 10:28:51	Seq Line:	9
Sample Name:	1927207002 10X	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD09.D Sample Name: 1927207002 10X

Injection Date:	9/25/2019 10:28:51	Seq Line:	9
Sample Name:	1927207002 10X	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	10.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.478	PBA	2988541.8	460.2045	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.494	PBA	889516.5	453.3028	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.497	PBA	203977.8	50.0000	CLO4-89-ISTD

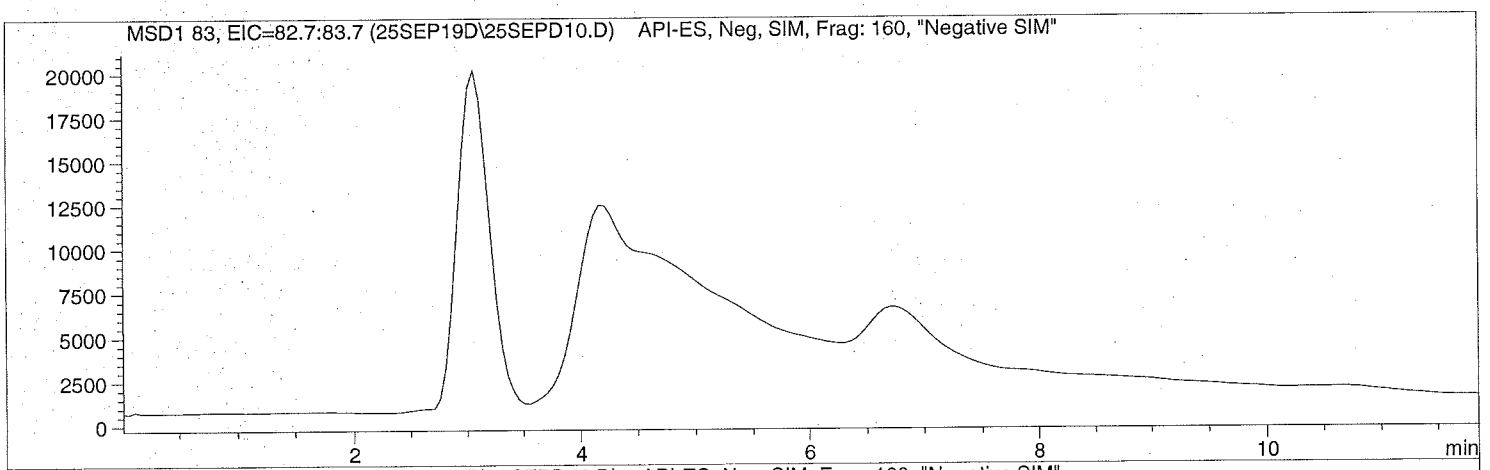
*** End of Report ***

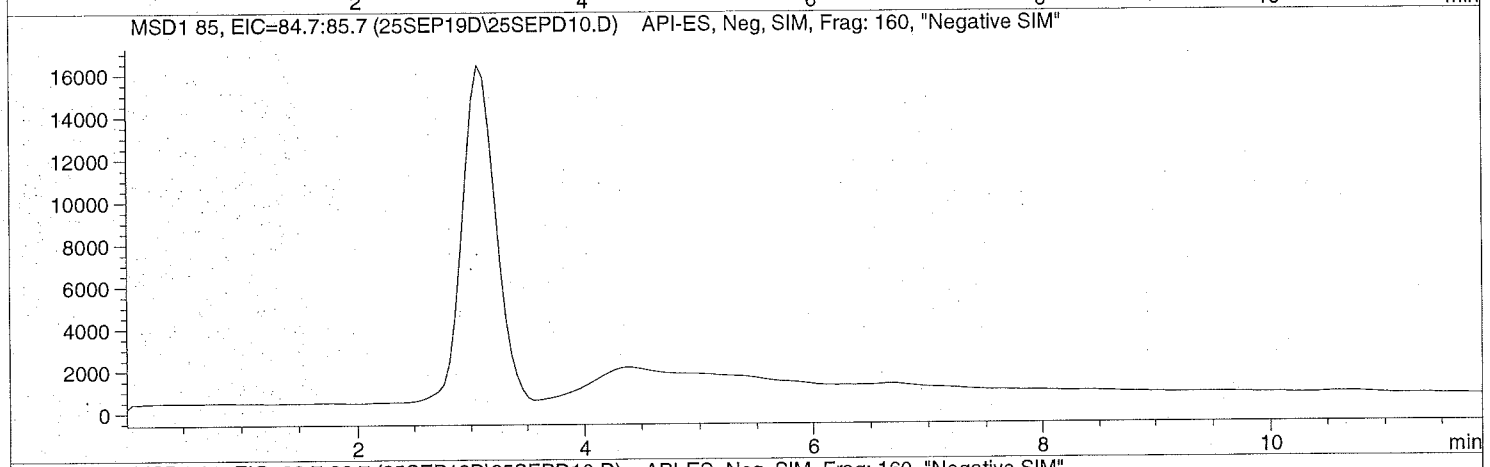
Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD10.D Sample Name: 1927207003

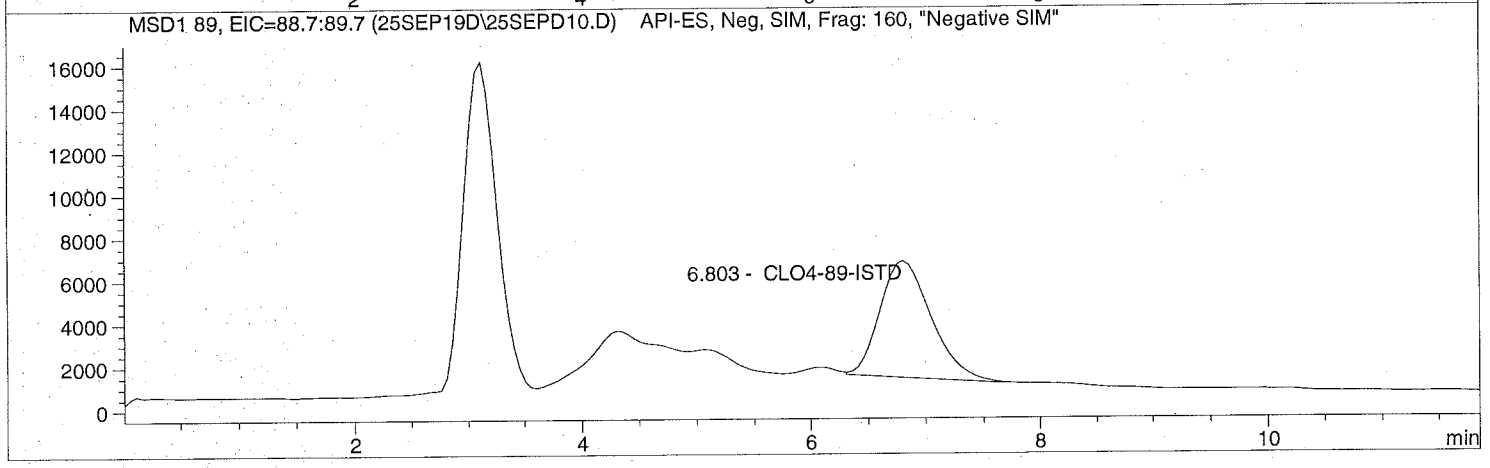
Injection Date:	9/25/2019 10:42:41	Seq Line:	10
Sample Name:	1927207003	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD10.D Sample Name: 1927207003

Injection Date:	9/25/2019 10:42:41	Seq Line:	10
Sample Name:	1927207003	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.803	BBA	167627.2	5.0000	CLO4-89-ISTD

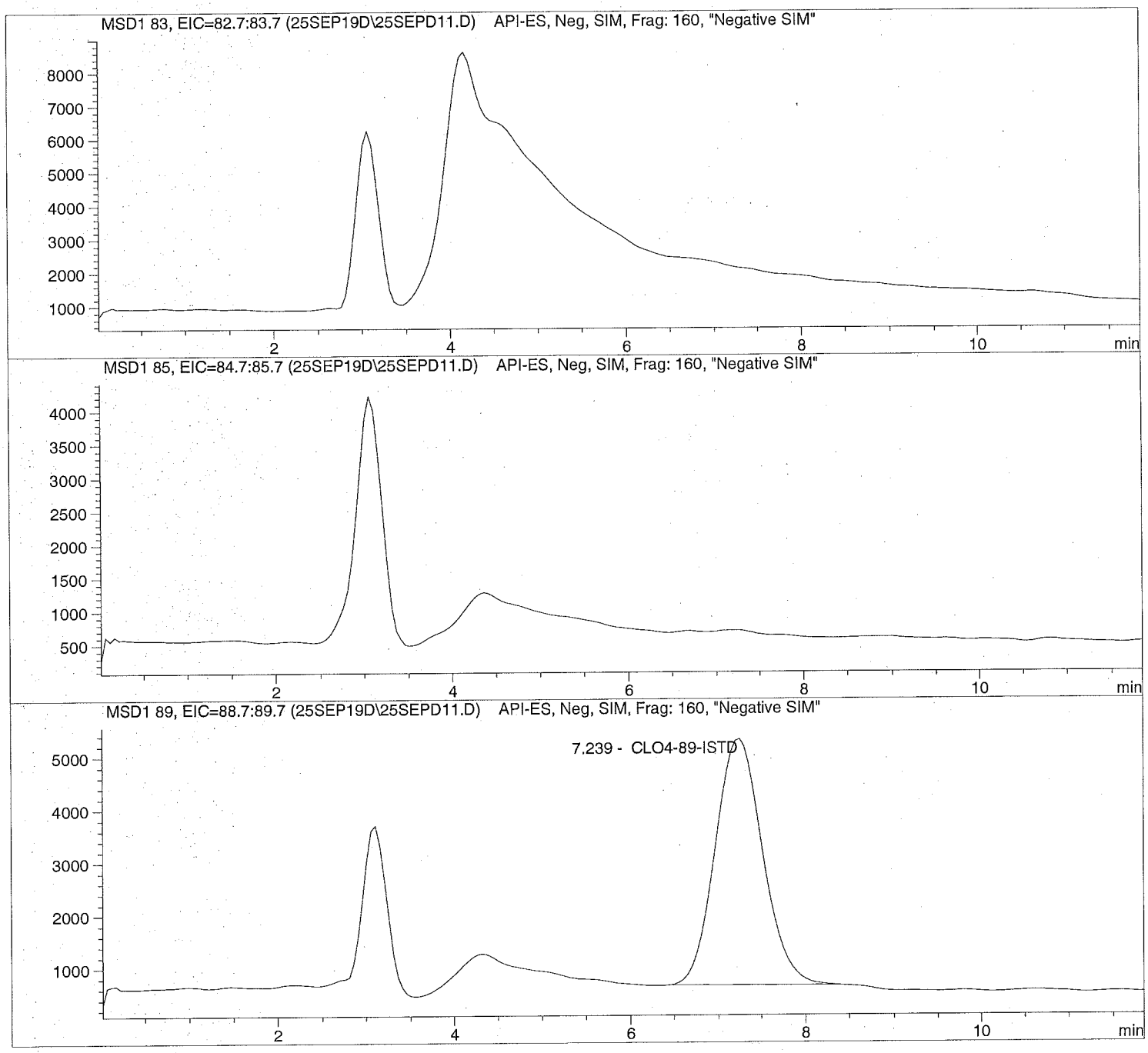
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD11.D Sample Name: 1927207004

Injection Date:	9/25/2019 10:56:29	Seq Line:	11
Sample Name:	1927207004	Location:	Vial 81
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD11.D Sample Name: 1927207004

Injection Date:	9/25/2019 10:56:29	Seq Line:	11
Sample Name:	1927207004	Location:	Vial 81
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.239	PBA	177076.9	5.0000	CLO4-89-ISTD

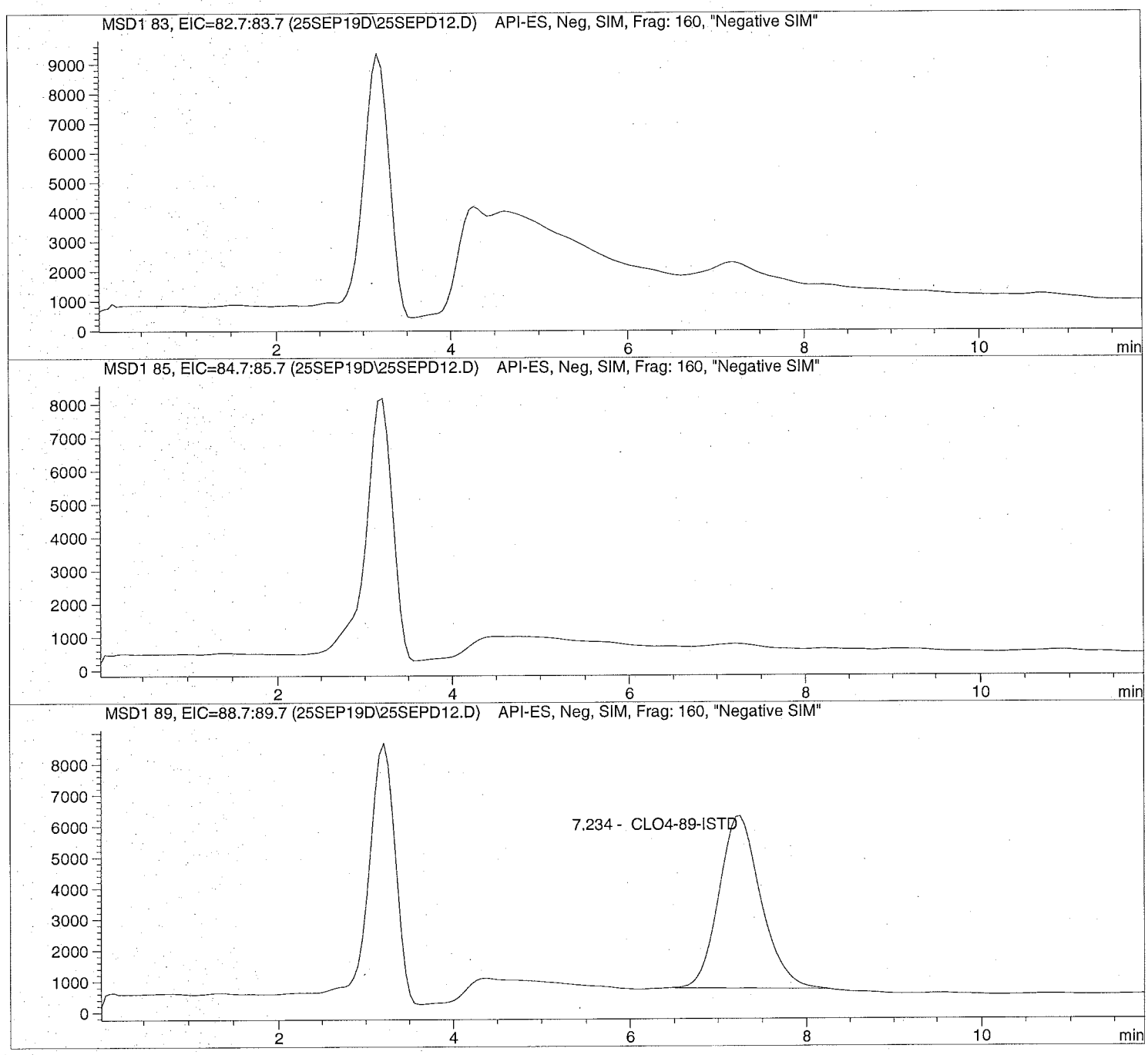
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD12.D Sample Name: 1927207005

Injection Date:	9/25/2019 11:10:17	Seq Line:	12
Sample Name:	1927207005	Location:	Vial 82
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD12.D Sample Name: 1927207005

Injection Date:	9/25/2019 11:10:17	Seq Line:	12
Sample Name:	1927207005	Location:	Vial 82
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.234	BBA	182947.6	5.0000	CLO4-89-ISTD

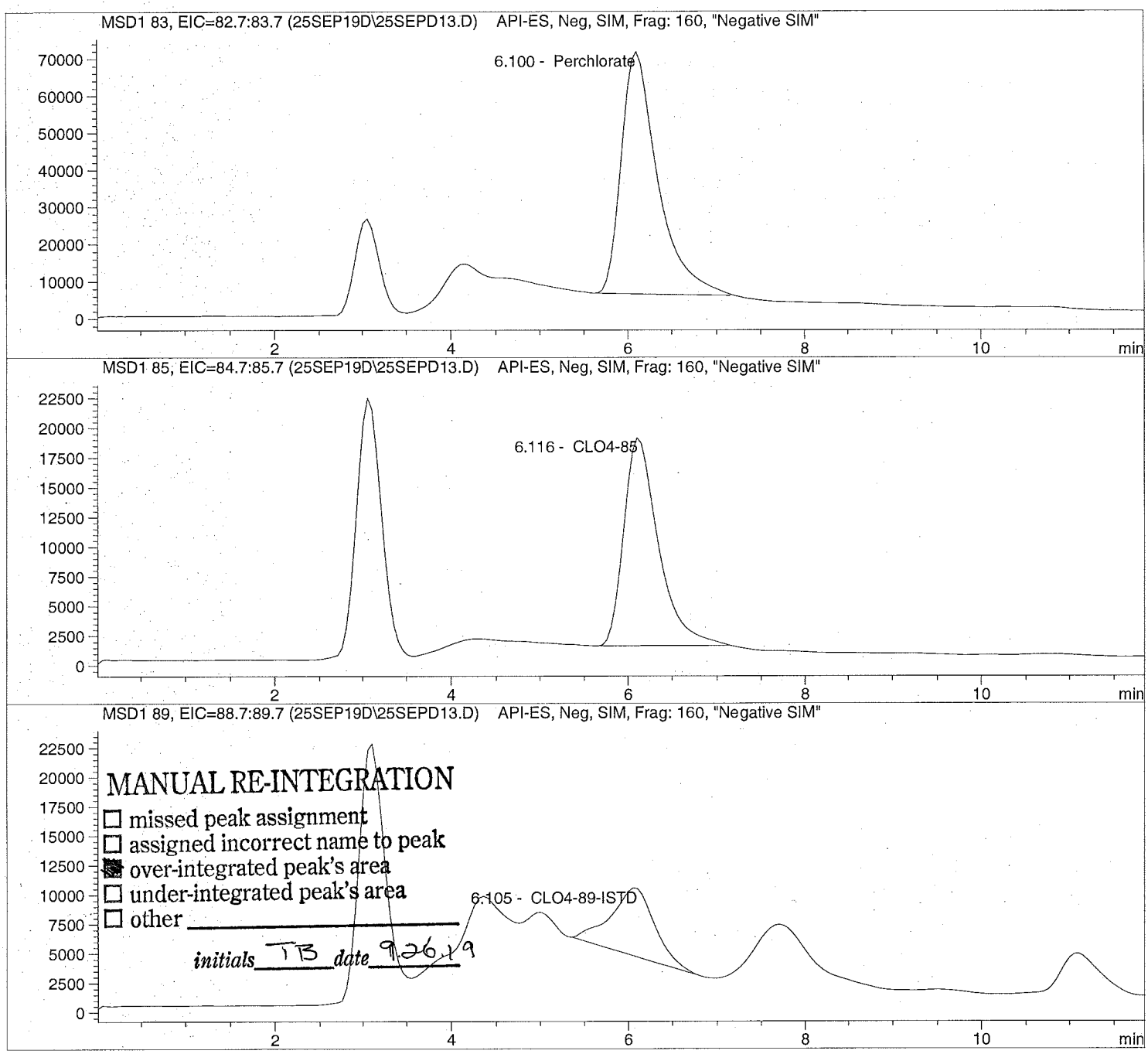
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD13.D Sample Name: 1927207006

Injection Date:	9/25/2019 11:24:03	Seq Line:	13
Sample Name:	1927207006	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



MANUAL RE-INTEGRATION
☐ missed peak assignment
☐ assigned incorrect name to peak
☒ over-integrated peak's area
☐ under-integrated peak's area
☐ other _____
initials TB date 9.26.19

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD13.D Sample Name: 1927207006

Injection Date:	9/25/2019 11:24:03	Seq Line:	13
Sample Name:	1927207006	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.100	BBA	1881866.3	31.0739	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.116	PBA	480234.9	26.5101	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.105	MM	201847.6	5.0000	CLO4-89-ISTD

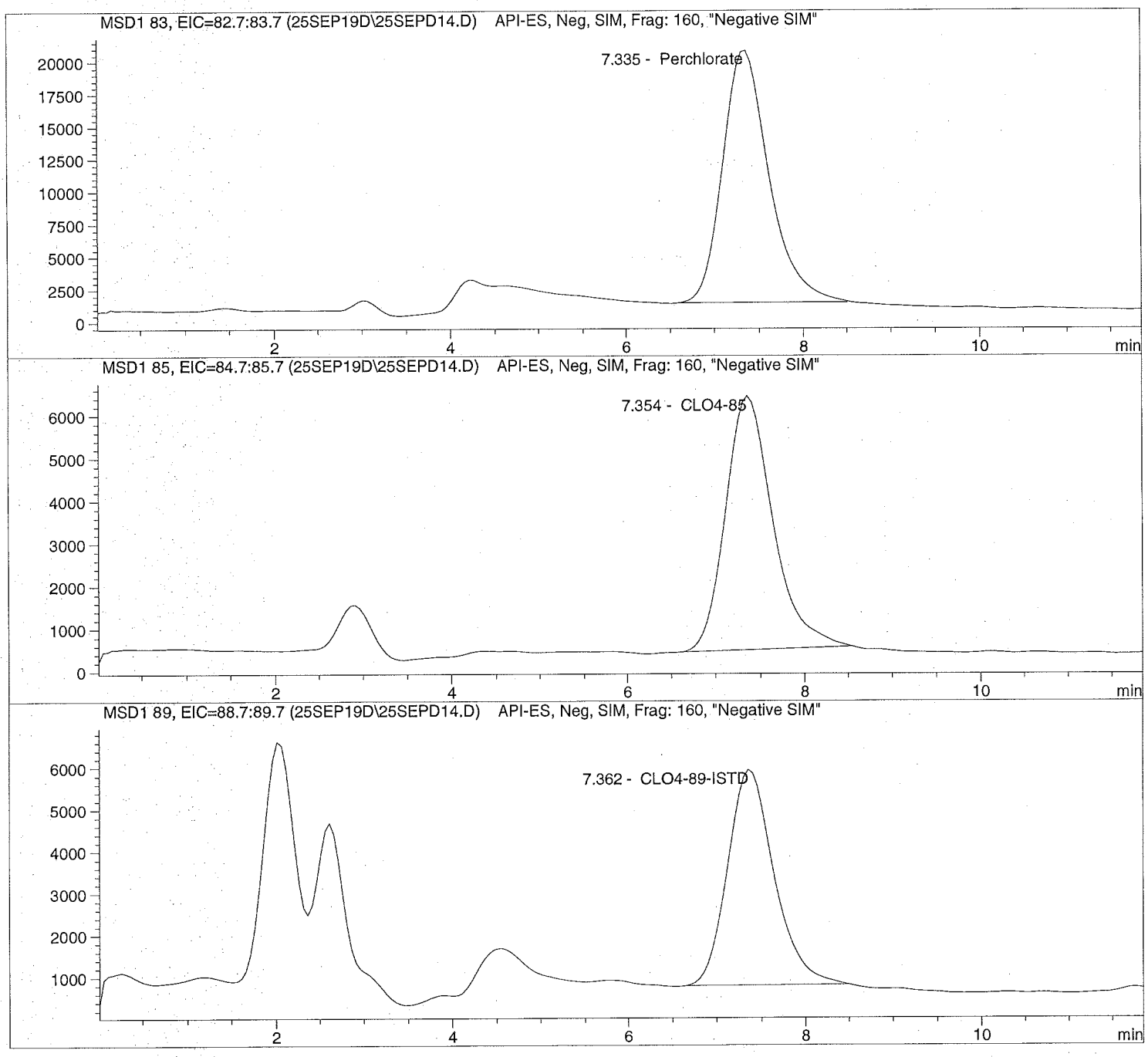
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD14.D Sample Name: 1927207007 10X

Injection Date:	9/25/2019 11:37:52	Seq Line:	14
Sample Name:	1927207007 10X	Location:	Vial 84
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD14.D Sample Name: 1927207007 10X

Injection Date:	9/25/2019 11:37:52	Seq Line:	14
Sample Name:	1927207007 10X	Location:	Vial 84
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 10.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.335	PBA	693116.9	133.8740	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.354	PBA	218925.9	137.6610	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.362	PBA	185567.6	50.0000	CLO4-89-ISTD

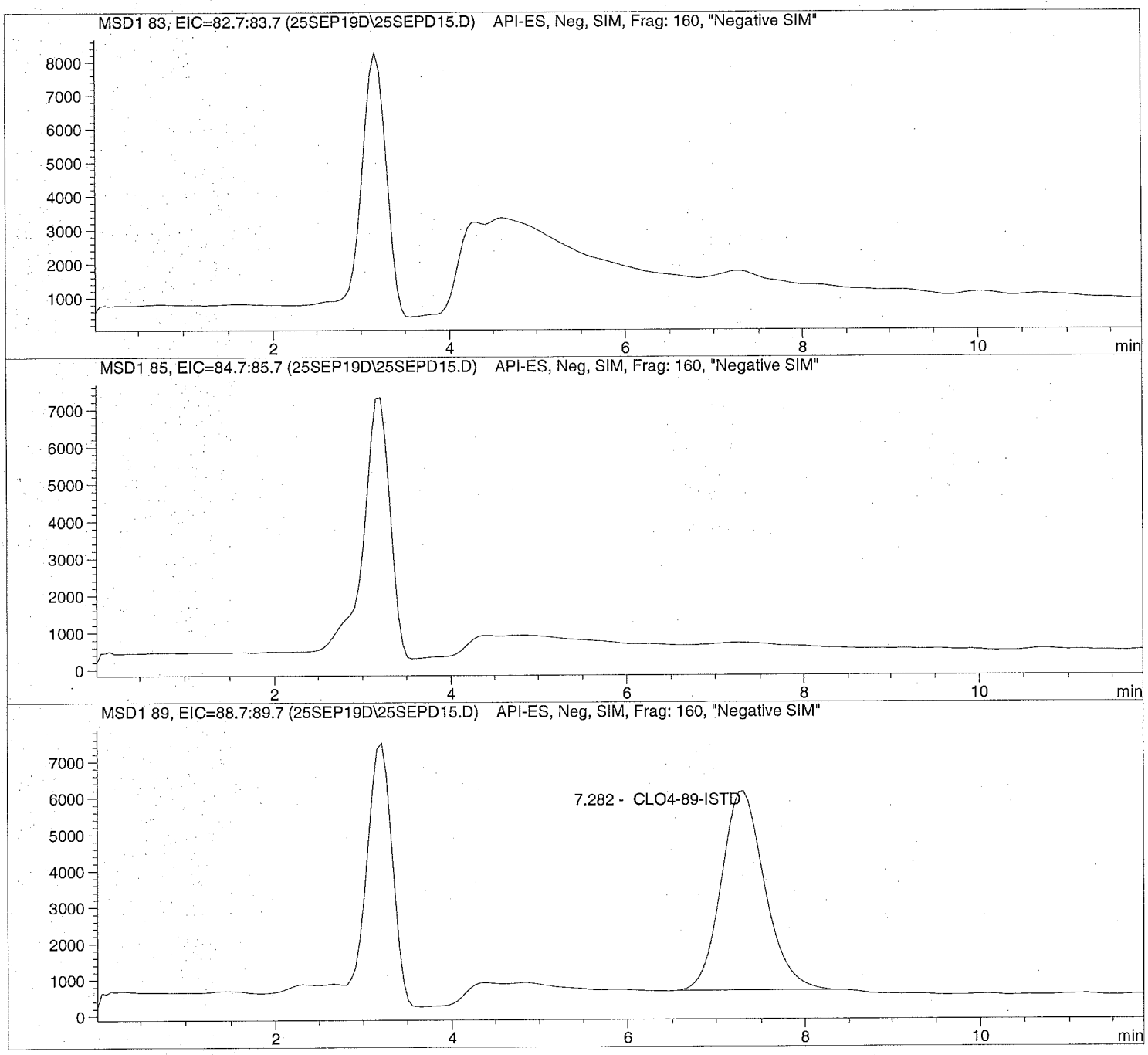
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD15.D Sample Name: 1927207008

Injection Date:	9/25/2019 11:51:39	Seq Line:	15
Sample Name:	1927207008	Location:	Vial 85
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD15.D Sample Name: 1927207008

Injection Date:	9/25/2019 11:51:39	Seq Line:	15
Sample Name:	1927207008	Location:	Vial 85
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.282	PBA	184103.5	5.0000	CLO4-89-ISTD

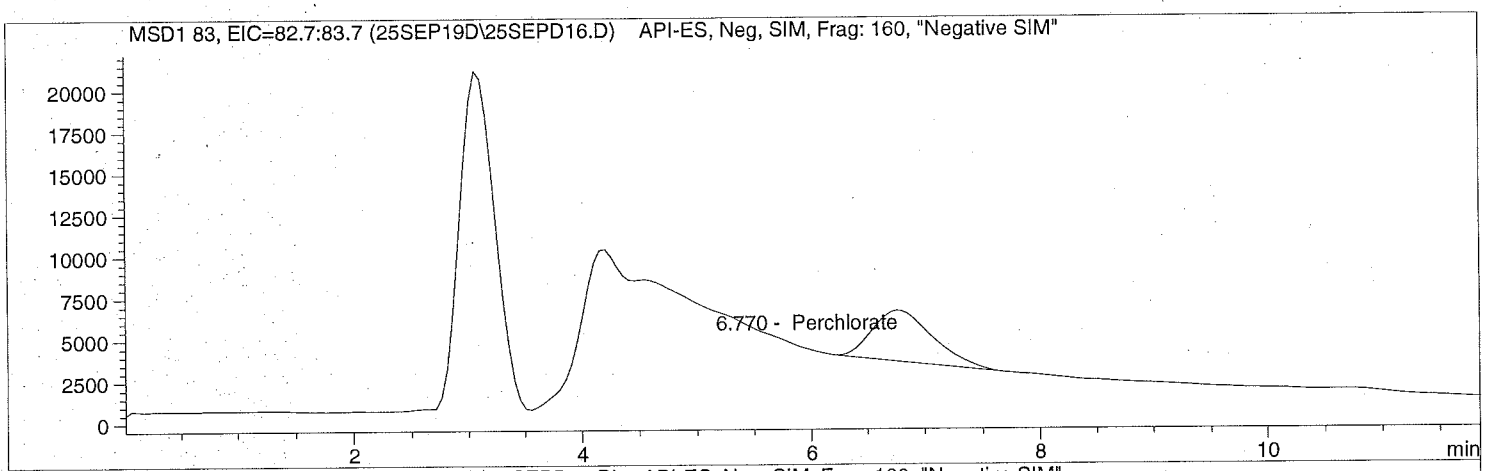
*** End of Report ***

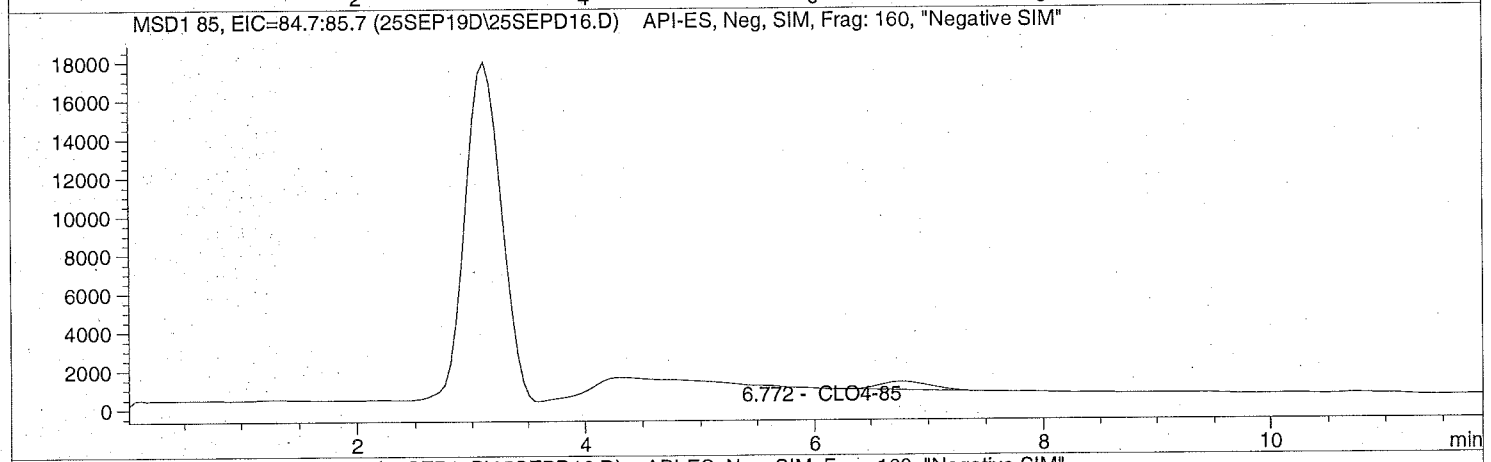
Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD16.D Sample Name: 1927207009

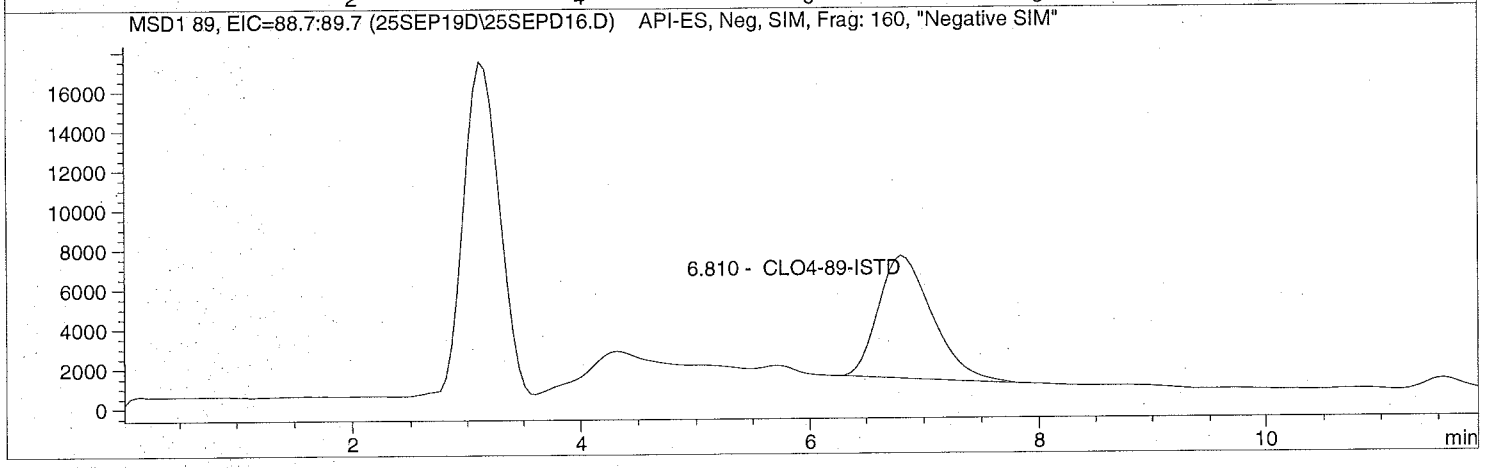
Injection Date:	9/25/2019 12:05:30	Seq Line:	16
Sample Name:	1927207009	Location:	Vial 86
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD16.D Sample Name: 1927207009

Injection Date:	9/25/2019 12:05:30	Seq Line:	16
Sample Name:	1927207009	Location:	Vial 86
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.770	BBA	111064.3	2.0258	Perchlorate

NOT REPORTED / RATIO FAILS CRITERI (83/85)

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.772	PBA	13398.1	0.6696	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.810	PBA	200027.4	5.0000	CLO4-89-ISTD

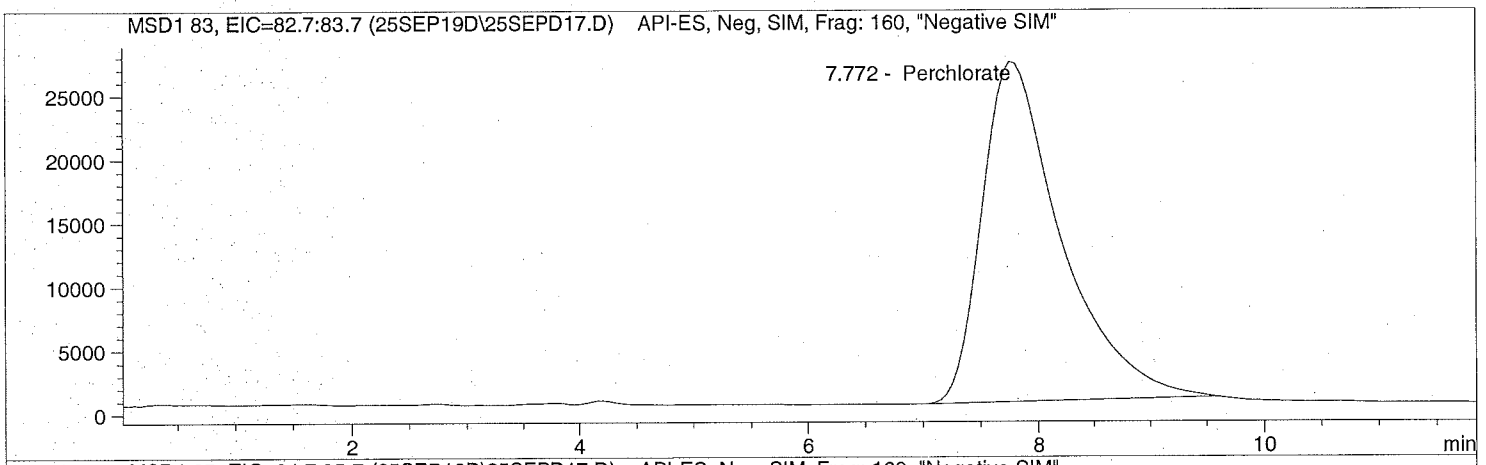
*** End of Report ***

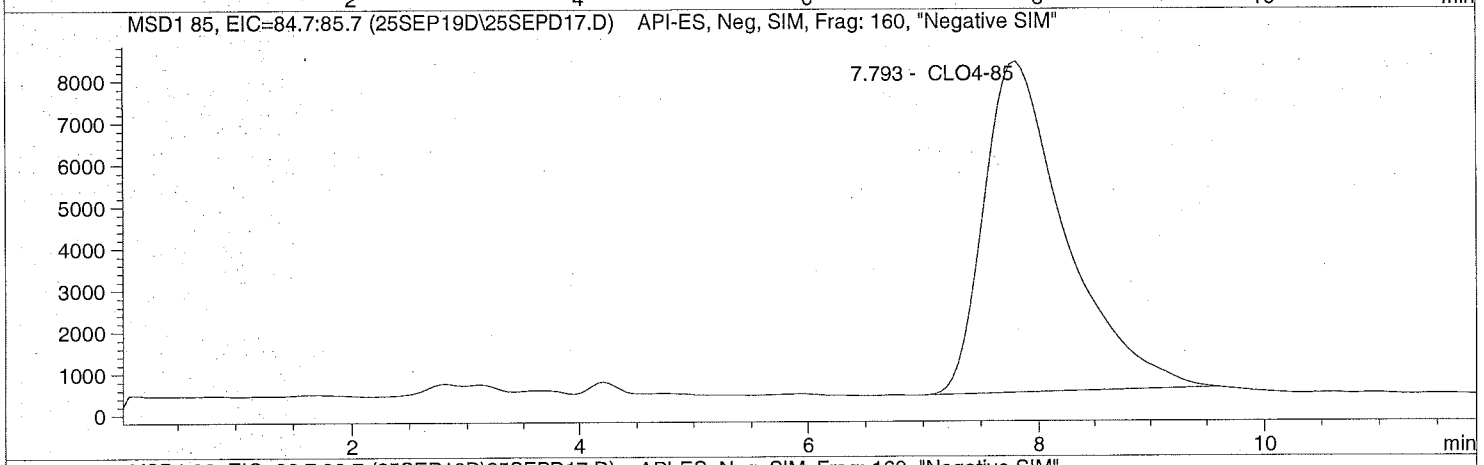
Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD17.D Sample Name: 675452 CCV@25

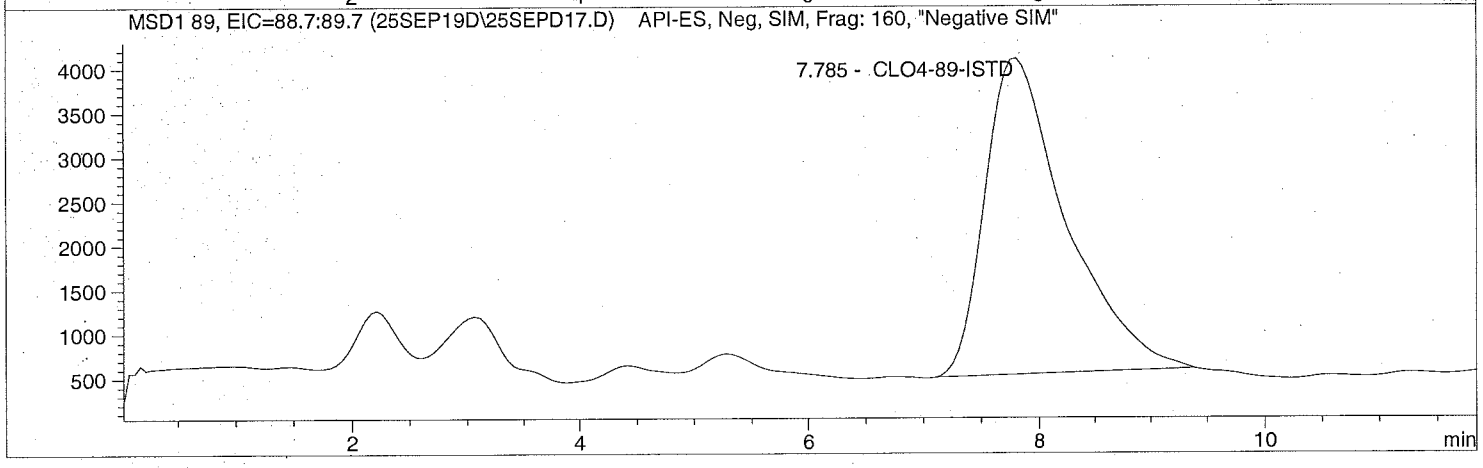
Injection Date:	9/25/2019 12:19:18	Seq Line:	17
Sample Name:	675452 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD17.D Sample Name: 675452 CCV@25

Injection Date:	9/25/2019 12:19:18	Seq Line:	17
Sample Name:	675452 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.772	PBA	1279619.1	24.9031	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	393112.7	25.0723	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.785	PBA	175644.5	5.0000	CLO4-89-ISTD

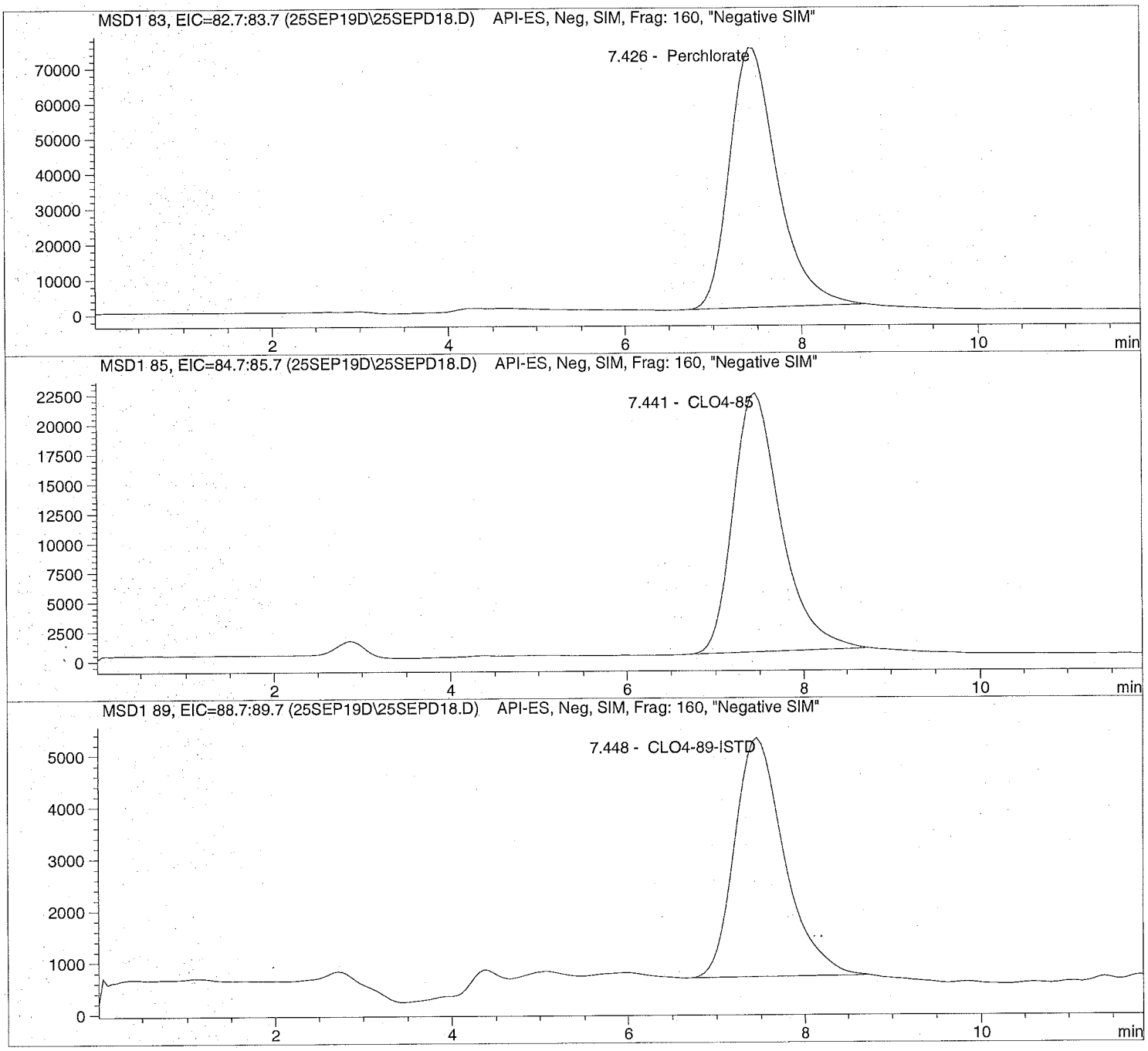
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD18.D Sample Name: 1927207010 10X

Injection Date:	9/25/2019 12:34:51	Seq Line:	18
Sample Name:	1927207010 10X	Location:	Vial 87
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD18.D Sample Name: 1927207010 10X

Injection Date:	9/25/2019 12:34:51	Seq Line:	18
Sample Name:	1927207010 10X	Location:	Vial 87
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 10.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.426	PBA	2749347.5	477.5033	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.441	PBA	819118.9	470.9470	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.448	PBA	179651.3	50.0000	CLO4-89-ISTD

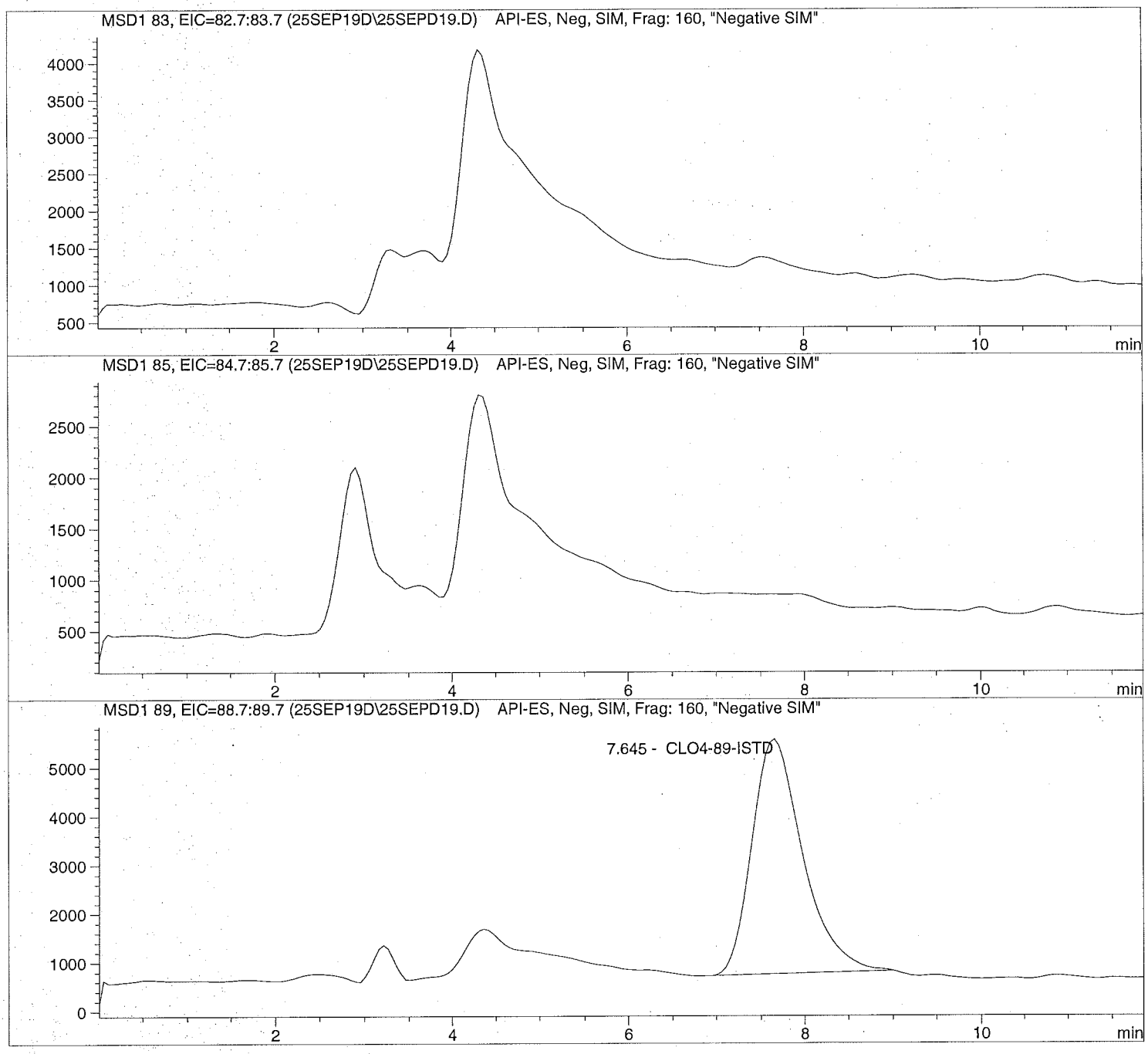
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD19.D Sample Name: 1927207011

Injection Date:	9/25/2019 12:48:38	Seq Line:	19
Sample Name:	1927207011	Location:	Vial 88
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD19.D Sample Name: 1927207011

Injection Date:	9/25/2019 12:48:38	Seq Line:	19
Sample Name:	1927207011	Location:	Vial 88
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.645	PBA	192431.6	5.0000	CLO4-89-ISTD

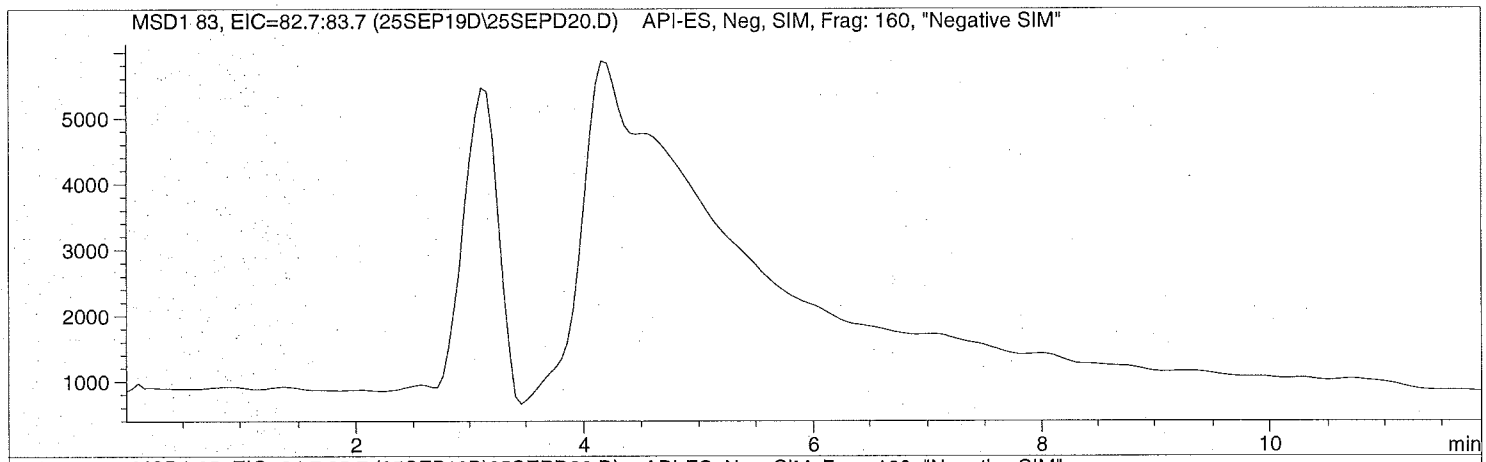
*** End of Report ***

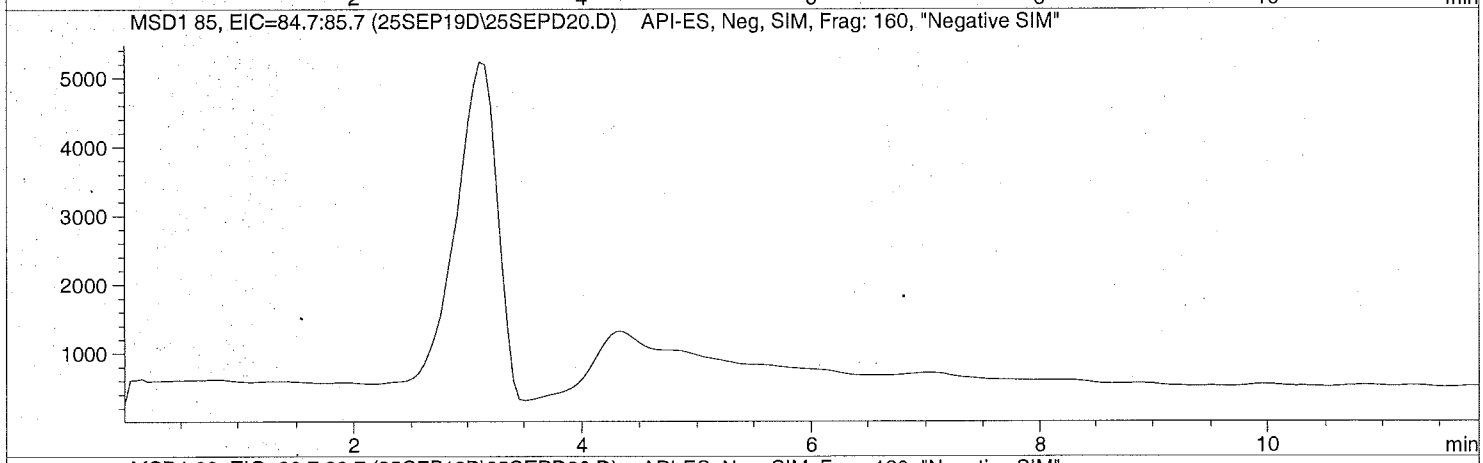
Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD20.D Sample Name: 1927207012

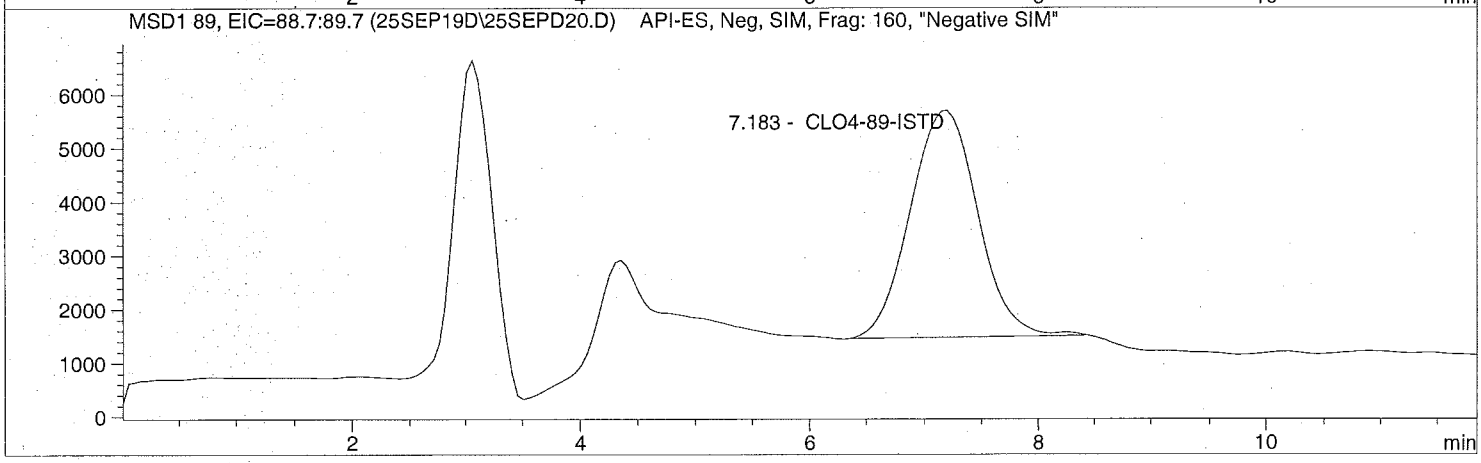
Injection Date:	9/25/2019 13:02:29	Seq Line:	20
Sample Name:	1927207012	Location:	Vial 89
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD20.D Sample Name: 1927207012

Injection Date:	9/25/2019 13:02:29	Seq Line:	20
Sample Name:	1927207012	Location:	Vial 89
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.183	PBA	172716.4	5.0000	CLO4-89-ISTD

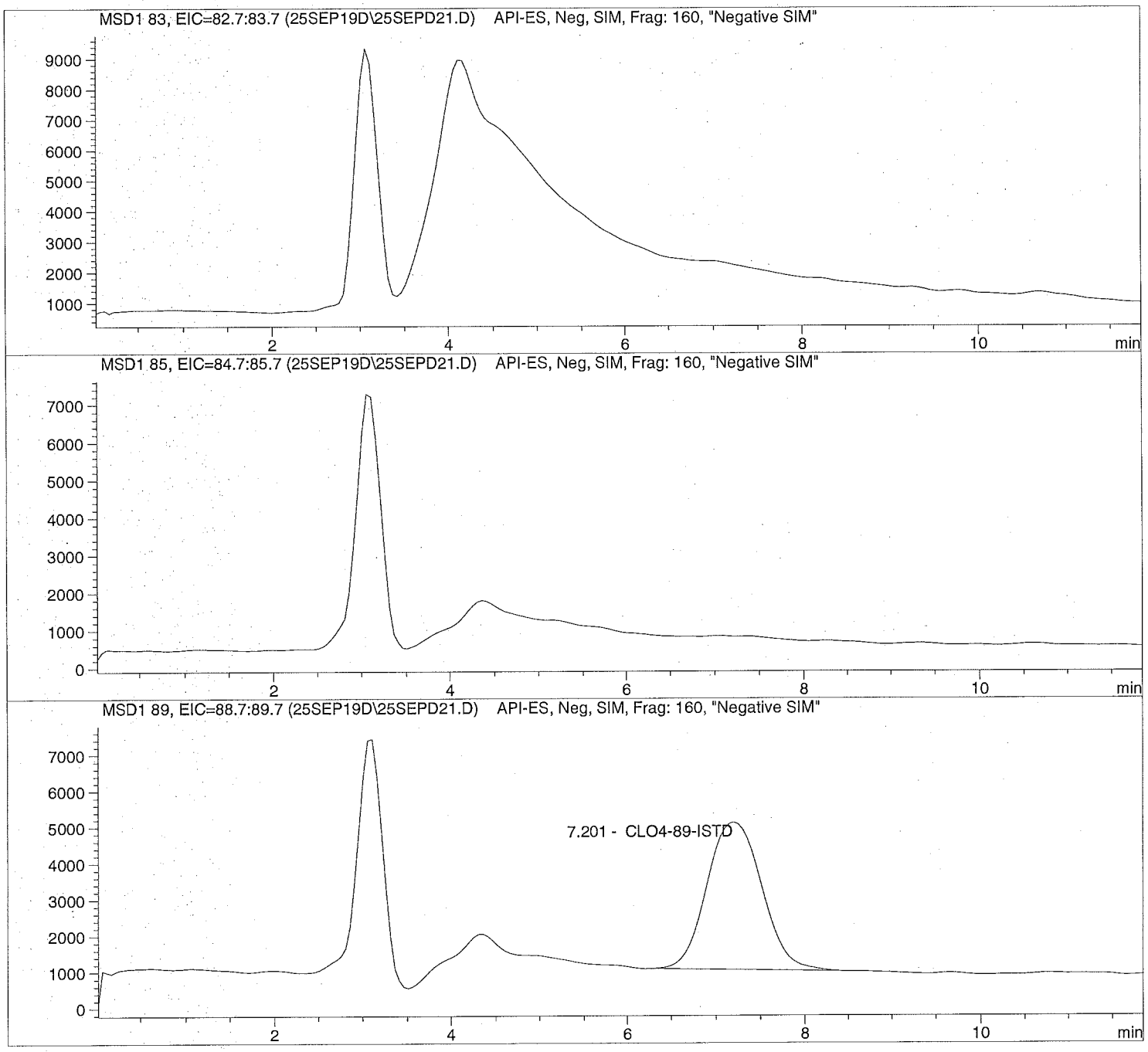
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD21.D Sample Name: 1927207013

Injection Date:	9/25/2019 13:16:17	Seq Line:	21
Sample Name:	1927207013	Location:	Vial 90
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD21.D Sample Name: 1927207013

Injection Date:	9/25/2019 13:16:17	Seq Line:	21
Sample Name:	1927207013	Location:	Vial 90
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.201	PBA	174006.0	5.0000	CLO4-89-ISTD

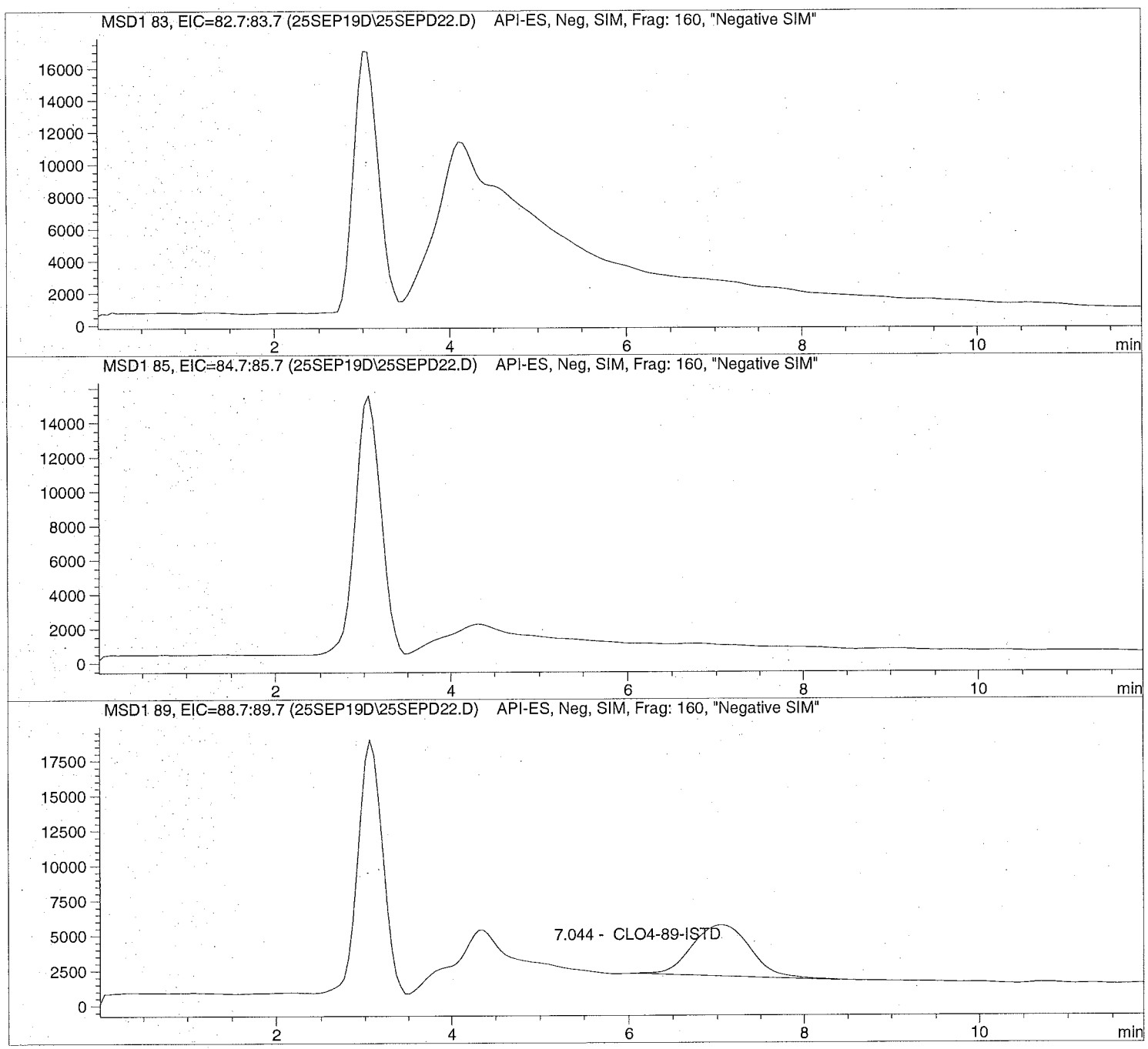
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD22.D Sample Name: 1927207014

Injection Date:	9/25/2019 13:30:08	Seq Line:	22
Sample Name:	1927207014	Location:	Vial 91
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD22.D Sample Name: 1927207014

Injection Date:	9/25/2019 13:30:08	Seq Line:	22
Sample Name:	1927207014	Location:	Vial 91
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.044	PBA	167770.5	5.0000	CLO4-89-ISTD

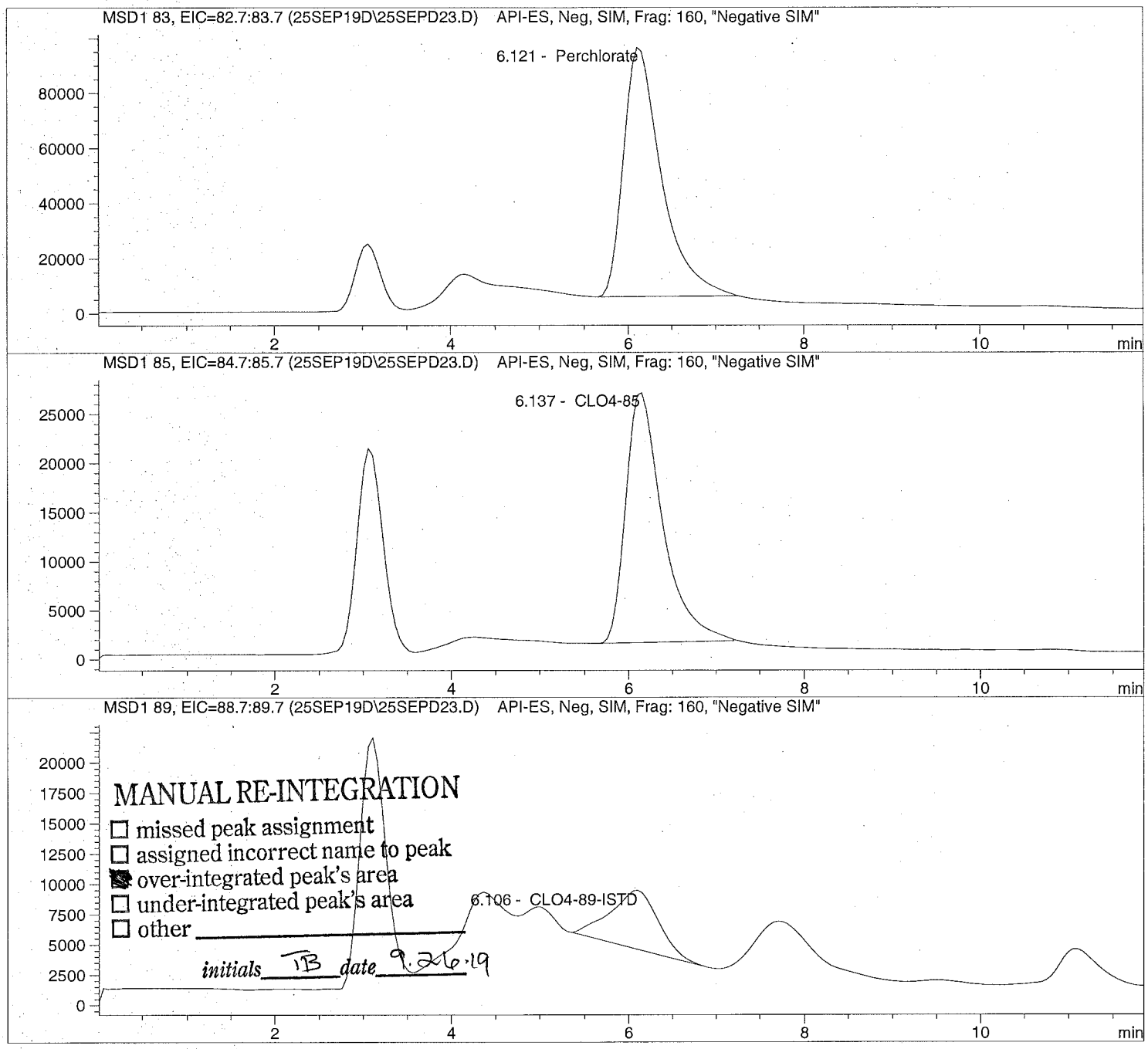
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD23.D Sample Name: 1927207006 MS-25

Injection Date:	9/25/2019 13:43:55	Seq Line:	23
Sample Name:	1927207006 MS-25	Location:	Vial 61
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD23.D Sample Name: 1927207006 MS-25

Injection Date:	9/25/2019 13:43:55	Seq Line:	23
Sample Name:	1927207006 MS-25	Location:	Vial 61
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Mon, 23. Sep. 2019,00:20:59 pm
Multiplier: 1.000000
Dilution: 1.000000
Sample Amount: 0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.121	PBA	2732867.5	46.5539	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.137	PBA	747215.8	42.6266	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.106	MM	184009.8	5.0000	CLO4-89-ISTD

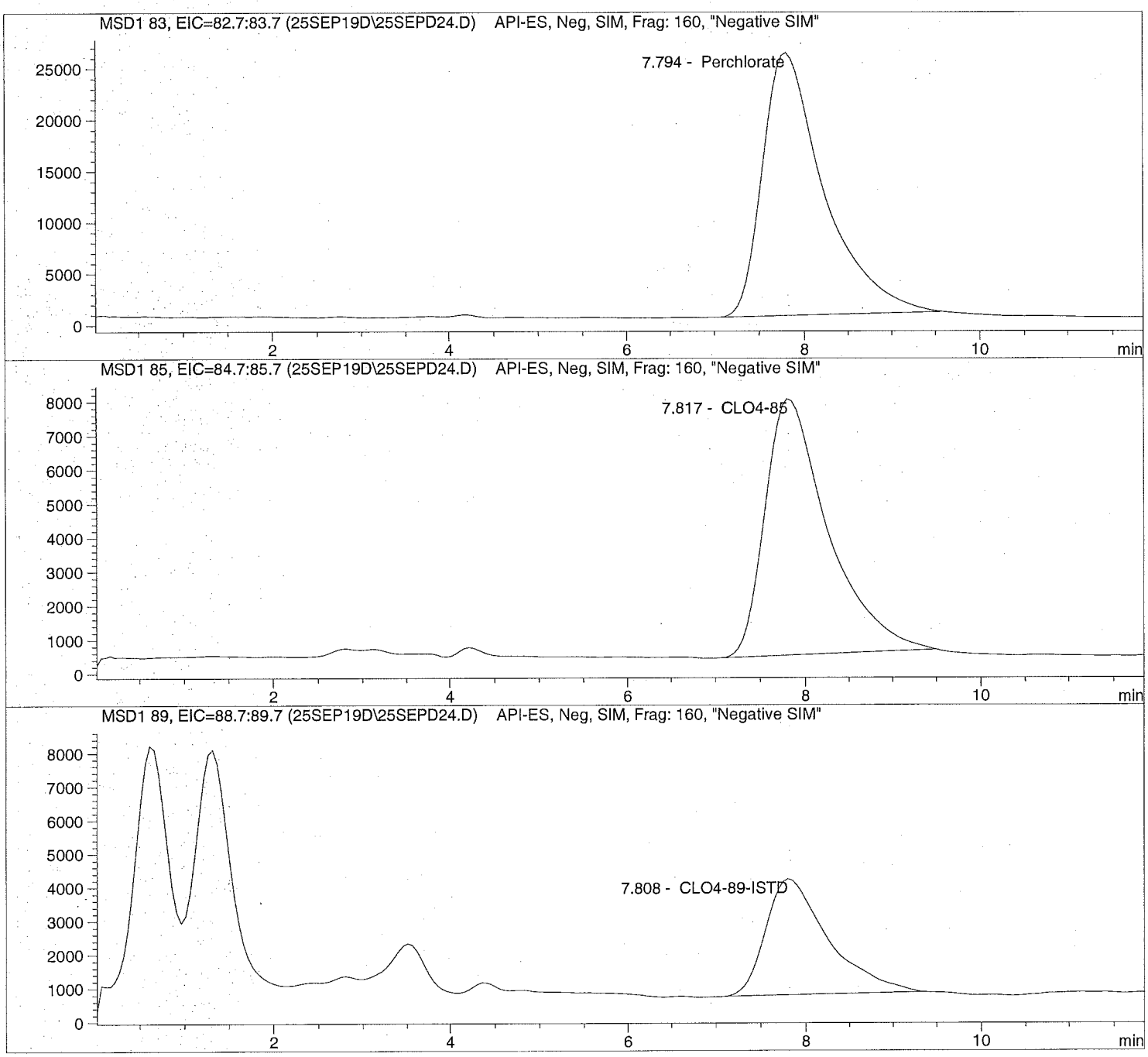
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD24.D Sample Name: 675453 CCV@25

Injection Date:	9/25/2019 13:59:10	Seq Line:	24
Sample Name:	675453 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD24.D Sample Name: 675453 CCV@25

Injection Date:	9/25/2019 13:59:10	Seq Line:	24
Sample Name:	675453 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.794	PBA	1221554.3	25.0034	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.817	PBA	369755.7	24.8352	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.808	PBA	166932.8	5.0000	CLO4-89-ISTD

*** End of Report ***

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

Initial Calibration

Method C:\HPCHEM\1\METHODS\CLO4-DP3.M

```
==================================================================
                          Calibration Table
==================================================================

Perchlorate

Calib. Data Modified  :      9/23/2019 12:20:59 PM

Calculate             :      Internal Standard
Based on              :      Peak Area

Rel. Reference Window :     20.000 %
Abs. Reference Window :      0.000 min
Rel. Non-ref. Window  :     20.000 %
Abs. Non-ref. Window  :      0.000 min
Use Multiplier & Dilution Factor with ISTDs
Uncalibrated Peaks    :      not reported
Partial Calibration   :      No recalibration if peaks missing

Curve Type            :      Quadratic (some peaks differ, see below)
Origin                :      Ignored (some peaks differ, see below)
Weight                :      Linear (Amnt) (some peaks differ, see below)

Recalibration Settings:
Average Response      :      Average all calibrations
Average Retention Time:      Floating Average New 75%

Calibration Report Options :
    Printout of recalibrations within a sequence:
        Calibration Table after Recalibration
        Normal Report after Recalibration
    If the sequence is done with bracketing:
        Results of first cycle (ending previous bracket)

Default Sample ISTD Information (if not set in sample table):
ISTD  ISTD Amount   Name
  #
----|-------------|-------------------------
  1      5.00000   CLO4-89-ISTD

Signal 1: MSD1 83, EIC=82.7:83.7
Signal 2: MSD1 85, EIC=84.7:85.7
Signal 3: MSD1 89, EIC=88.7:89.7

RetTime   Lvl   Amount      Area     Amt/Area  Ref Grp Name
 [min] Sig
-------|--|--|----------|----------|----------|---|--|---------------
  7.750  1  3    1.00000 5.39218e4  1.85454e-5   1    Perchlorate
            4    2.00000 1.32825e5  1.50574e-5
            5    5.00000 2.76271e5  1.80982e-5
            6   10.00000 5.61298e5  1.78159e-5
            7   25.00000 1.51820e6  1.64669e-5
            8   50.00000 3.31156e6  1.50986e-5
            9   75.00000 5.23914e6  1.43153e-5
  7.767  3  3    5.00000 2.14568e5  2.33026e-5 +I1    CLO4-89-ISTD
            4    5.00000 2.04758e5  2.44190e-5
            5    5.00000 2.13407e5  2.34294e-5
            6    5.00000 2.09246e5  2.38953e-5
            7    5.00000 2.07403e5  2.41077e-5
            8    5.00000 2.02929e5  2.46391e-5
            9    5.00000 1.97933e5  2.52611e-5
  7.778  2  3    1.00000 1.70436e4  5.86732e-5   1    CLO4-85
            4    2.00000 4.20754e4  4.75337e-5
            5    5.00000 9.24707e4  5.40712e-5
            6   10.00000 1.68622e5  5.93041e-5
            7   25.00000 4.63724e5  5.39114e-5
            8   50.00000 9.95933e5  5.02042e-5
```

Method C:\HPCHEM\1\METHODS\CLO4-DP3.M

RetTime [min]	Lvl	Amount	Area	Amt/Area	Ref	Grp	Name
	9	75.00000	1.58066e6	4.74484e-5			

More compound-specific settings:

Compound: Perchlorate
- Time Window : From 3.581 min To 11.899 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 0.5
  - Level 5 : 0.2
  - Level 6 : 0.1
  - Level 7 : 0.04
  - Level 8 : 0.02
  - Level 9 : 0.013333

Compound: CLO4-89-ISTD
- Time Window : From 3.581 min To 11.896 min
- Curve Type : Linear
- Origin : Included
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 1
  - Level 5 : 1
  - Level 6 : 1
  - Level 7 : 1
  - Level 8 : 1
  - Level 9 : 1

Compound: CLO4-85
- Time Window : From 3.601 min To 11.913 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 3 : 1
  - Level 4 : 0.5
  - Level 5 : 0.2
  - Level 6 : 0.1
  - Level 7 : 0.04
  - Level 8 : 0.02
  - Level 9 : 0.013333

==========

Peak Sum Table

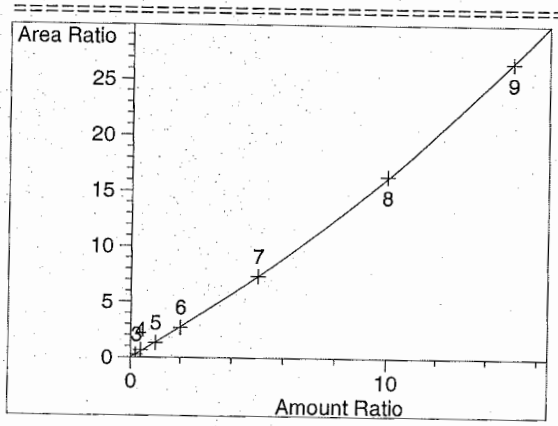
==========

No Entries in table

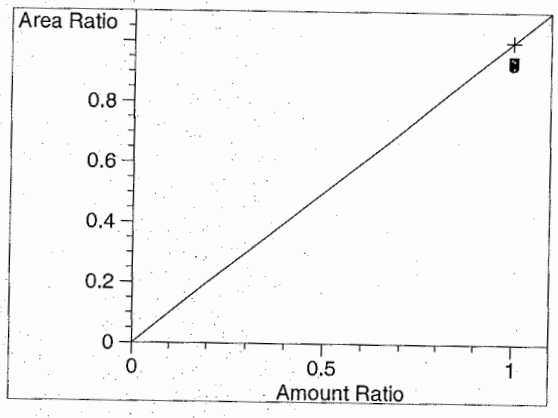
==========

Method C:\HPCHEM\1\METHODS\CLO4-DP3.M

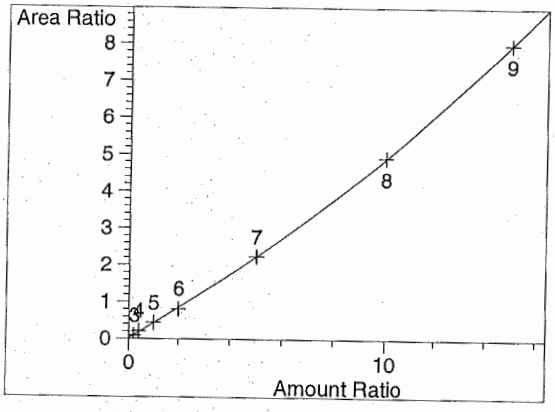
Calibration Curves



Perchlorate at exp. RT: 7.750
MSD1 83, EIC=82.7:83.7
Correlation: 0.99975
Residual Std. Dev.: 0.10284
Formula: $y = ax^2 + bx + c$
a: 3.10463e-2
b: 1.30369
c: 2.19496e-2
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 0.5
Level 5 : 0.2
Level 6 : 0.1
Level 7 : 0.04
Level 8 : 0.02
Level 9 : 0.013333



CLO4-89-ISTD at exp. RT: 7.767
MSD1 89, EIC=88.7:89.7
Correlation: 1.00000
Residual Std. Dev.: 0.00000
Formula: $y = mx + b$
m: 1.00000
b: 0.00000
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 1
Level 5 : 1
Level 6 : 1
Level 7 : 1
Level 8 : 1
Level 9 : 1



CLO4-85 at exp. RT: 7.778
MSD1 85, EIC=84.7:85.7
Correlation: 0.99969
Residual Std. Dev.: 0.02601
Formula: $y = ax^2 + bx + c$
a: 8.85207e-3
b: 3.99283e-1
c: 1.33505e-2
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 3 : 1
Level 4 : 0.5
Level 5 : 0.2
Level 6 : 0.1
Level 7 : 0.04
Level 8 : 0.02
Level 9 : 0.013333

Batch Report: C:\HPCHEM\1\DATA\20SEP19I\20SEP19D.B

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP3.M

['#' ==> Run has not been reprocessed with Batch Review Method
'*' ==> Run has been saved with batch file]

#*	Sample	Location	Inj	SampleType	Run	Perchlorate Area	Perchlorat RT	Perchlorate Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	5.39218e4	7.750	8.75982e-1
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	1.32825e5	7.797	2.37682
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	2.76271e5	7.770	4.77237
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	5.61298e5	7.785	9.75097
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	1.51820e6	7.741	25.01082
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	3.31156e6	7.775	50.40300
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	5.23914e6	7.736	74.79107
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	5.74879e5	7.756	10.11855

#*	Sample	Location	Inj	SampleType	Run	CLO4-89-ISTD Area	CLO4-89-IS RT	CLO4-89-ISTD Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	2.14568e5	7.767	5.00000
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	2.04758e5	7.816	5.00000
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	2.13407e5	7.793	5.00000
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	2.09246e5	7.798	5.00000
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	2.07403e5	7.763	5.00000
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	2.02929e5	7.800	5.00000
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	1.97933e5	7.765	5.00000
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	2.06243e5	7.776	5.00000

#*	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	1.70436e4	7.778	8.24488e-1
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	4.20754e4	7.805	2.38090
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	9.24707e4	7.787	5.14166
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	1.68622e5	7.781	9.52209
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	4.63724e5	7.760	25.04916
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	9.95933e5	7.793	50.14223
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	1.58066e6	7.758	74.93659
#*	ICAL Verf@10ug/L	Vial 80	1	Control	11	1.71000e5	7.760	9.79043

*** End of Report ***

Sequence: C:\HPCHEM\1\SEQUENCE\CLO4\2019\SEP\20SEP19I.S

Sequence Table:

Method and Injection Info Part:

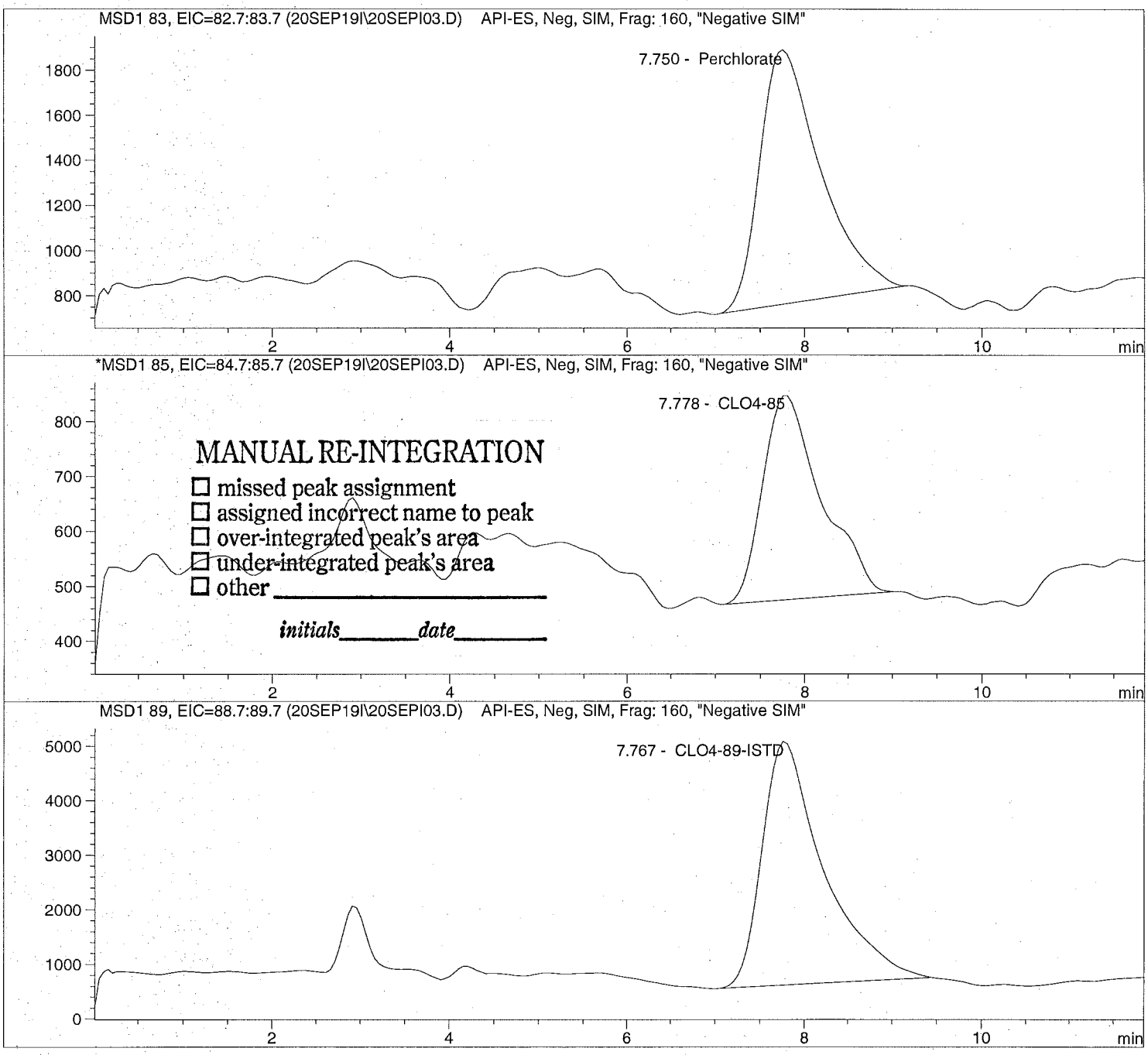
Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	CLO4@ 0.2ug/L	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	CLO4@ 0.5ug/L	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	CLO4@ 1.0ug/L	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	CLO4@ 2.0ug/L	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	CLO4@ 5.0ug/L	CLO4-AQN	1	Ctrl Samp		
6	Vial 76	CLO4@ 10.ug/L	CLO4-AQN	1	Ctrl Samp		
7	Vial 77	CLO4@ 25.ug/L	CLO4-AQN	1	Ctrl Samp		
8	Vial 78	CLO4@ 50.ug/L	CLO4-AQN	1	Ctrl Samp		
9	Vial 79	CLO4@ 75.ug/L	CLO4-AQN	1	Ctrl Samp		
10	Vial 71	CLO4@ 0.2ug/L	CLO4-AQN	1	Ctrl Samp		
11	Vial 80	ICAL Verf@10ug/L	CLO4-AQN	1	Ctrl Samp		

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	1.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.750	PBA	53921.8	0.8760	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.778	MM	17043.6	0.8245	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.767	PBA	214568.1	5.0000	CLO4-89-ISTD

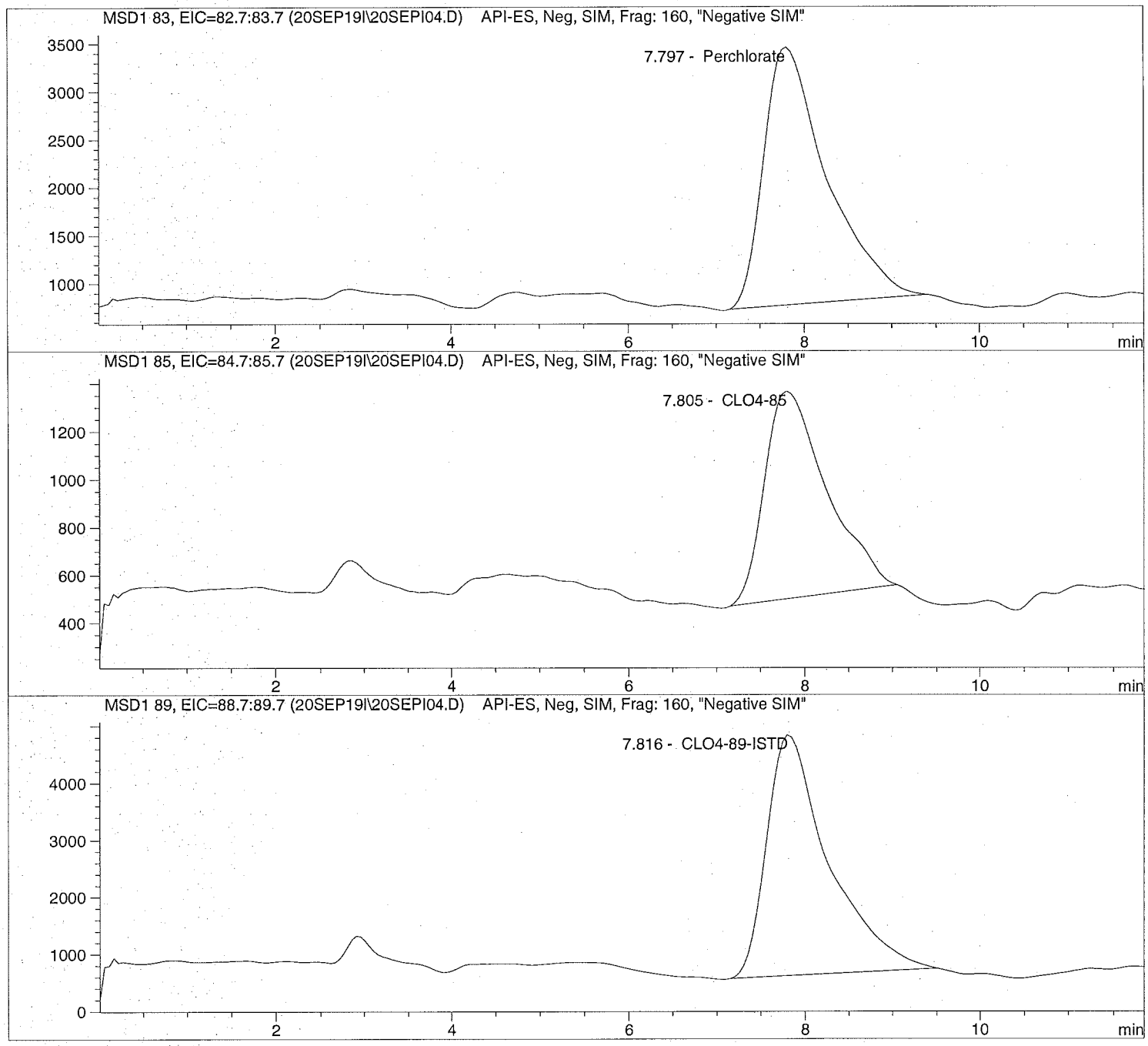
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI04.D Sample Name: CLO4@ 2.0ug/L

Injection Date:	9/20/2019 09:37:58	Seq Line:	4
Sample Name:	CLO4@ 2.0ug/L	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI04.D Sample Name: CLO4@ 2.0ug/L

Injection Date:	9/20/2019 09:37:58	Seq Line:	4
Sample Name:	CLO4@ 2.0ug/L	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	2.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.797	PBA	132825.2	2.3768	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.805	PBA	42075.4	2.3809	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.816	PBA	204758.3	5.0000	CLO4-89-ISTD

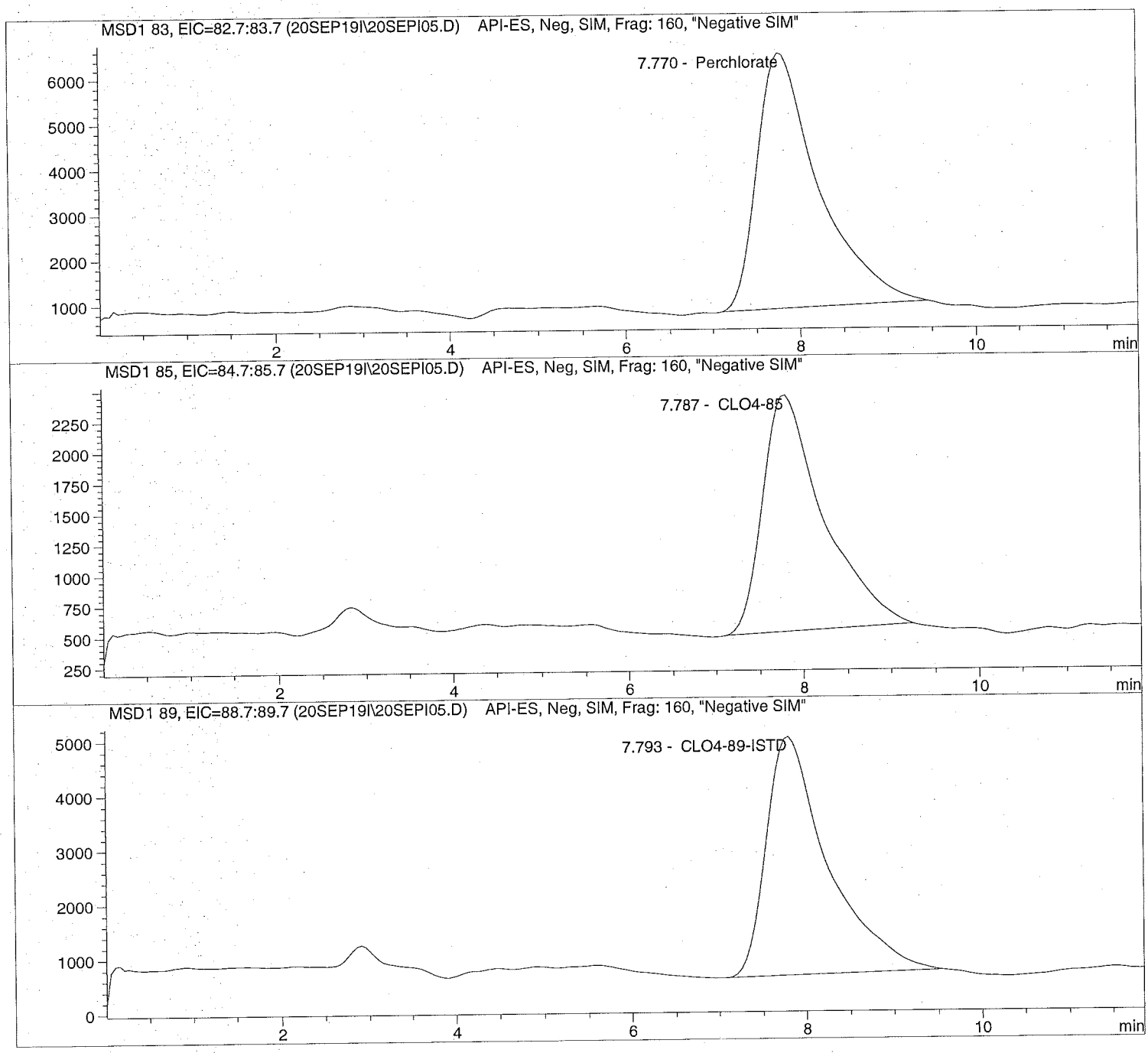
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	9/20/2019 09:51:49	Seq Line:	5
Sample Name:	CLO4@ 5.0ug/L	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	9/20/2019 09:51:49	Seq Line:	5
Sample Name:	CLO4@ 5.0ug/L	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	5.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.770	PBA	276270.7	4.7724	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.787	PBA	92470.7	5.1417	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	213407.0	5.0000	CLO4-89-ISTD

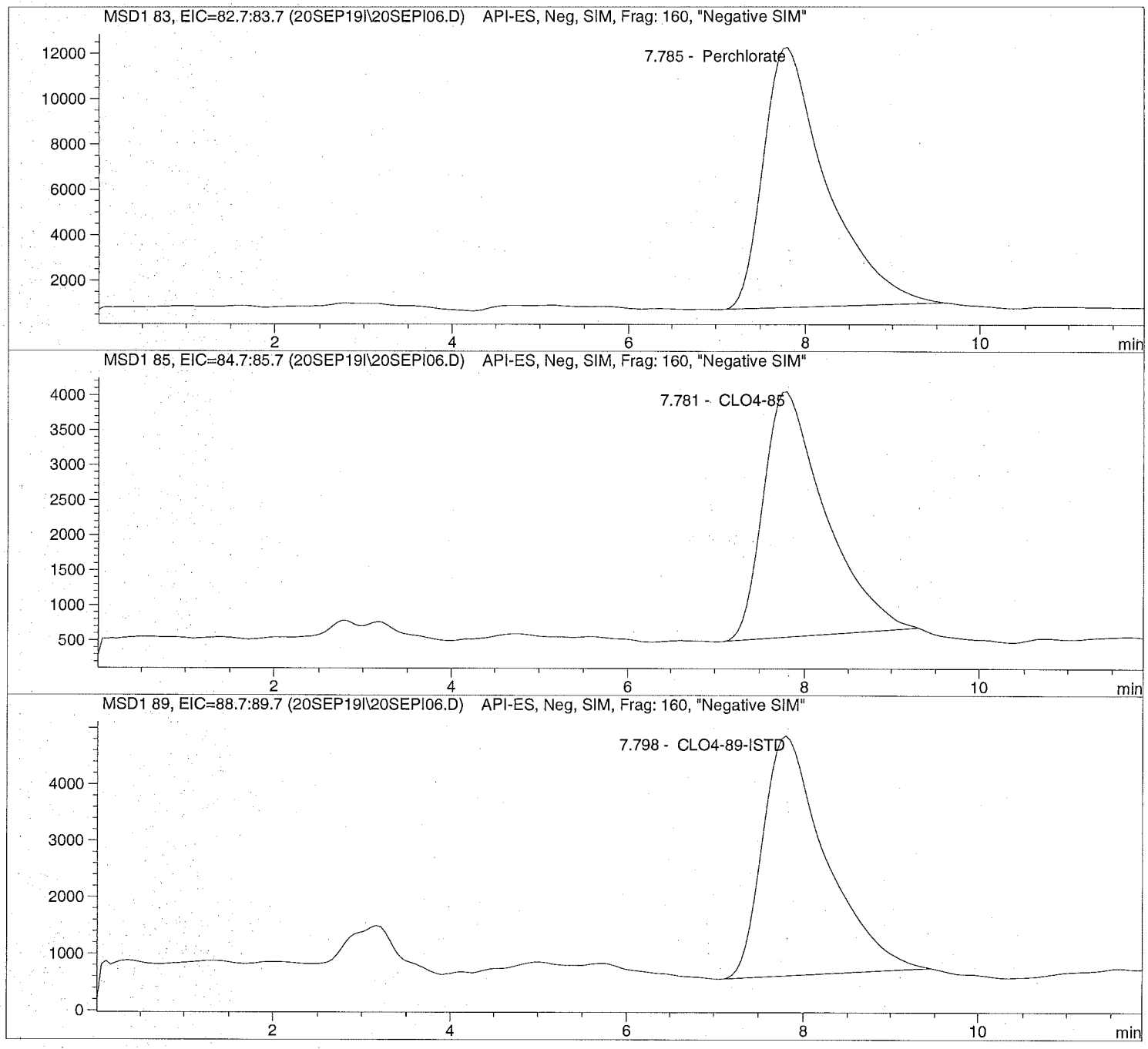
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI06.D Sample Name: CLO4@ 10.ug/L

Injection Date:	9/20/2019 10:05:36	Seq Line:	6
Sample Name:	CLO4@ 10.ug/L	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI06.D Sample Name: CLO4@ 10.ug/L

Injection Date:	9/20/2019 10:05:36	Seq Line:	6
Sample Name:	CLO4@ 10.ug/L	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	10.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.785	PBA	561297.7	9.7510	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.781	PBA	168622.4	9.5221	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.798	PBA	209246.3	5.0000	CLO4-89-ISTD

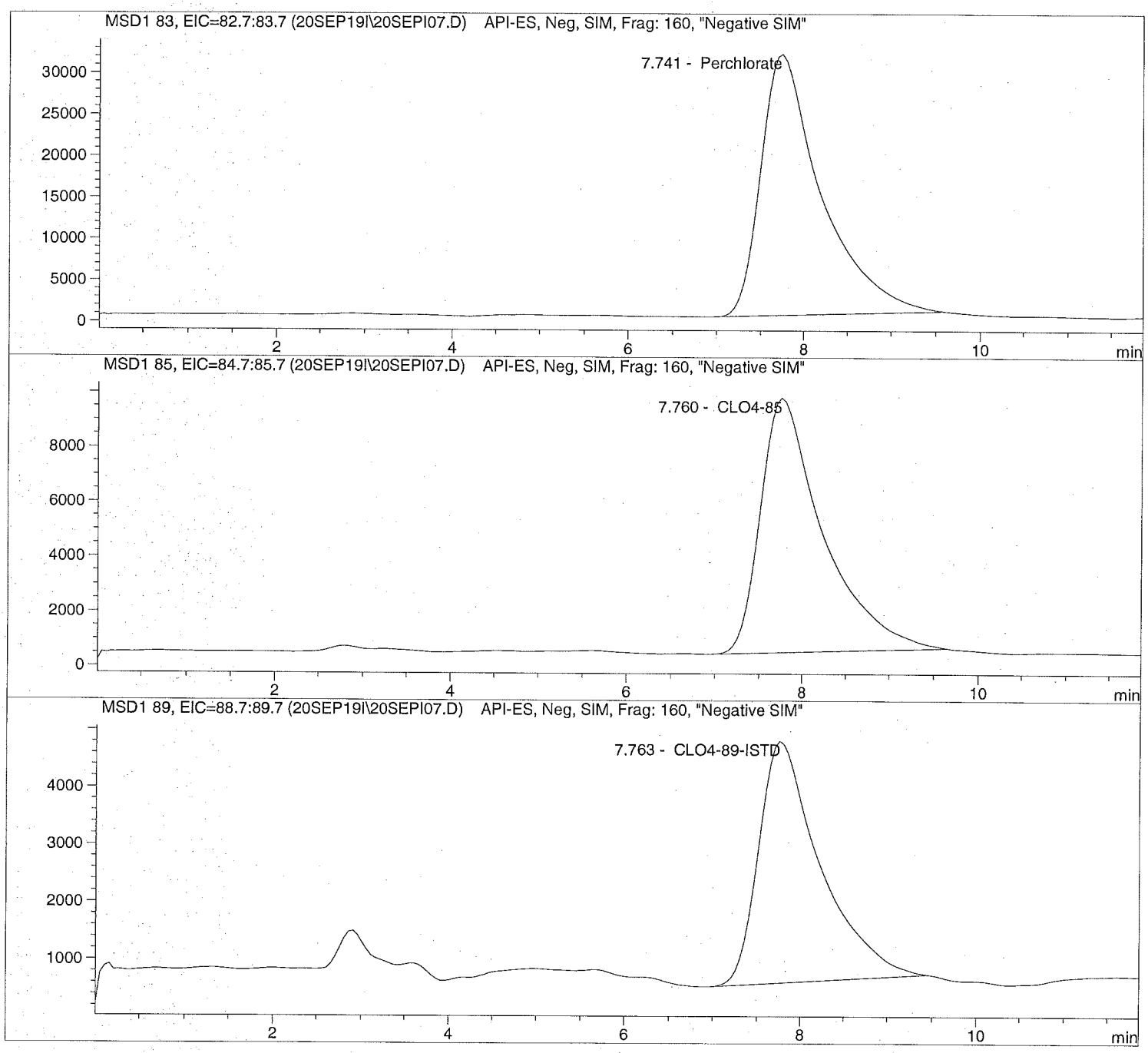
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	9/20/2019 10:19:23	Seq Line:	7
Sample Name:	CLO4@ 25.ug/L	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	9/20/2019 10:19:23	Seq Line:	7
Sample Name:	CLO4@ 25.ug/L	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	25.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.741	PBA	1518197.9	25.0108	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.760	PBA	463724.0	25.0492	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.763	PBA	207402.8	5.0000	CLO4-89-ISTD

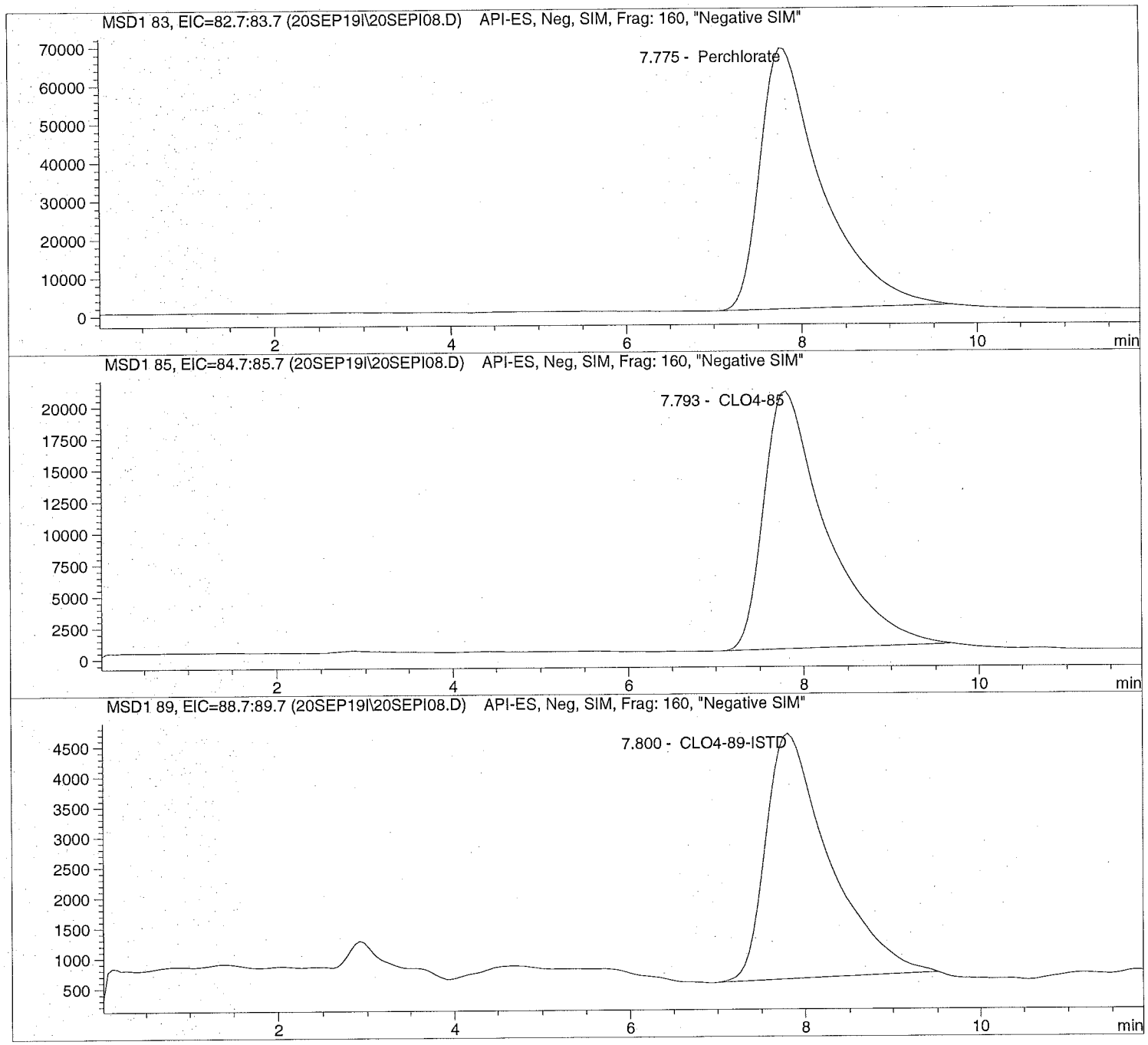
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI08.D Sample Name: CLO4@ 50.ug/L

Injection Date:	9/20/2019 10:33:18	Seq Line:	8
Sample Name:	CLO4@ 50.ug/L	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI08.D Sample Name: CLO4@ 50.ug/L

Injection Date:	9/20/2019 10:33:18	Seq Line:	8
Sample Name:	CLO4@ 50.ug/L	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	50.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.775	PBA	3311559.2	50.4030	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.793	PBA	995933.0	50.1422	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.800	PBA	202929.2	5.0000	CLO4-89-ISTD

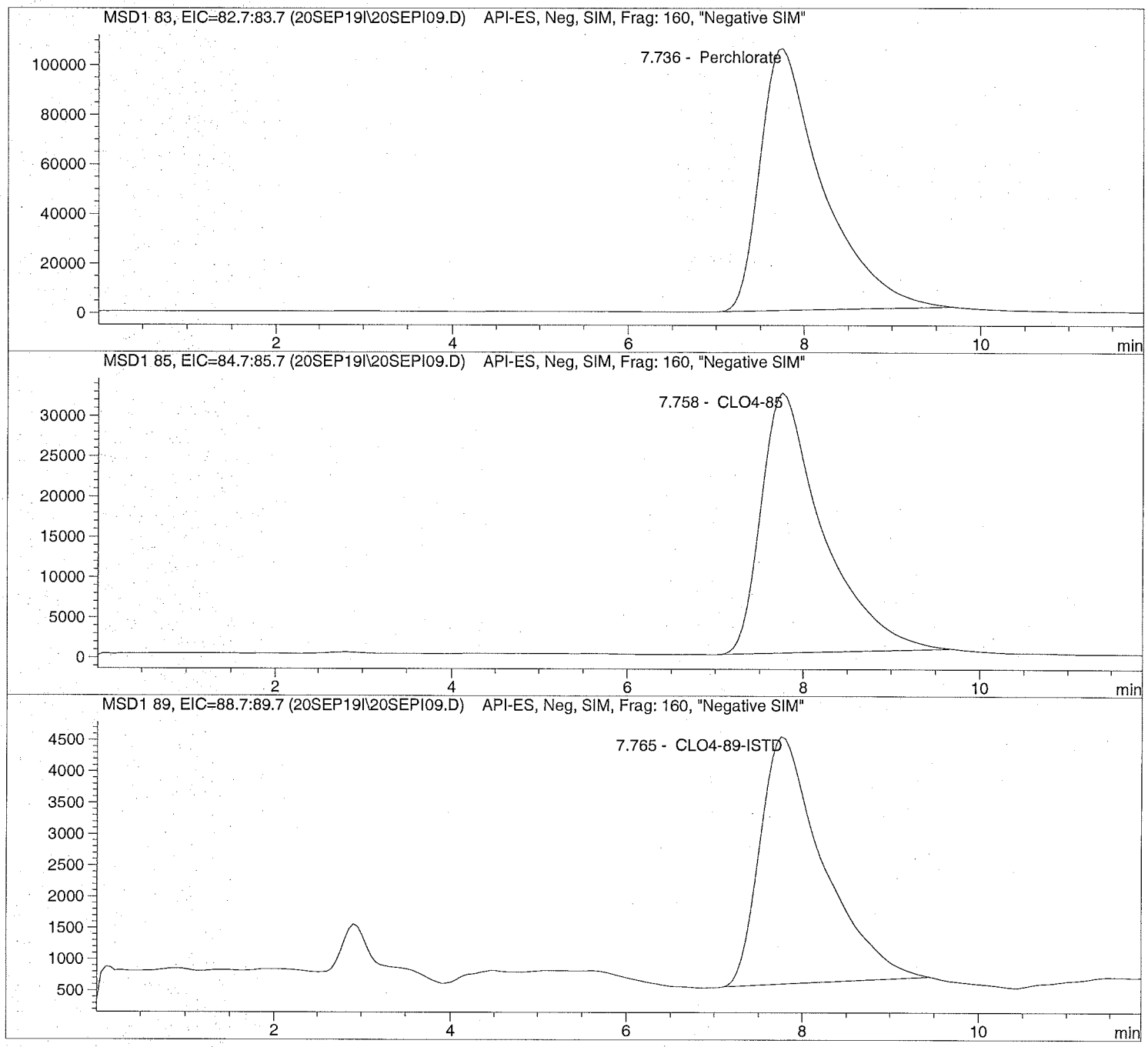
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	9/20/2019 10:47:05	Seq Line:	9
Sample Name:	CLO4@ 75.ug/L	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	9/20/2019 10:47:05	Seq Line:	9
Sample Name:	CLO4@ 75.ug/L	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	75.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.736	PBA	5239145.0	74.7911	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.758	PBA	1580664.2	74.9366	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.765	PBA	197932.5	5.0000	CLO4-89-ISTD

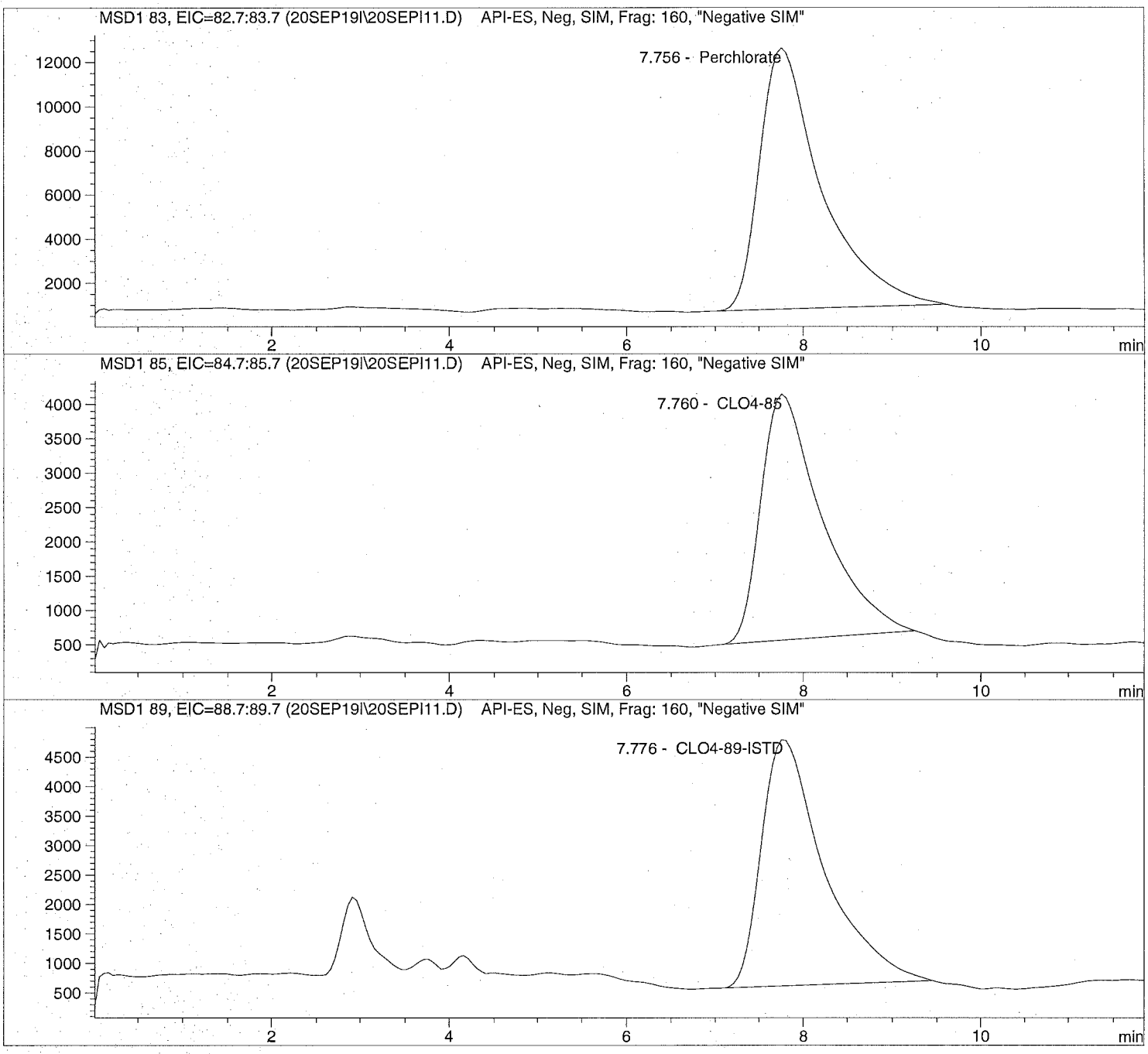
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI11.D Sample Name: ICAL Verf@10ug/L

Injection Date:	9/20/2019 11:14:45	Seq Line:	11
Sample Name:	ICAL Verf@10ug/L	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI11.D Sample Name: ICAL Verf@10ug/L

Injection Date:	9/20/2019 11:14:45	Seq Line:	11
Sample Name:	ICAL Verf@10ug/L	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:21:47

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	10.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.756	PBA	574879.4	10.1185	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.760	PBA	171000.4	9.7904	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.776	PBA	206243.3	5.0000	CLO4-89-ISTD

*** End of Report ***

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

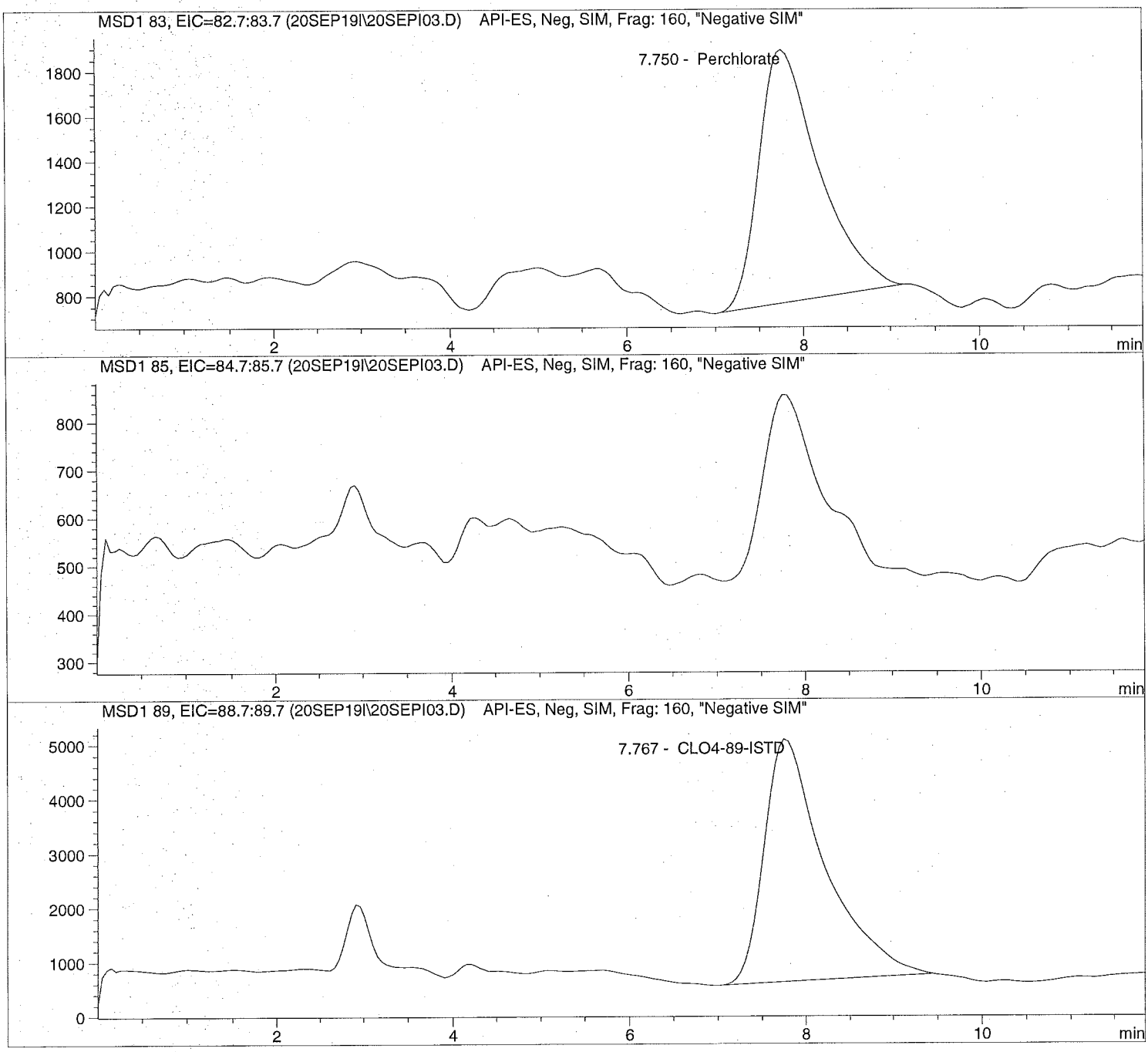
Unmodified

Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\20SEP19I\20SEPI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	9/20/2019 09:24:05	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	1.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.750	PBA	53921.8	0.8760	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
0.000		0.0	0.0000	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.767	PBA	214568.1	5.0000	CLO4-89-ISTD

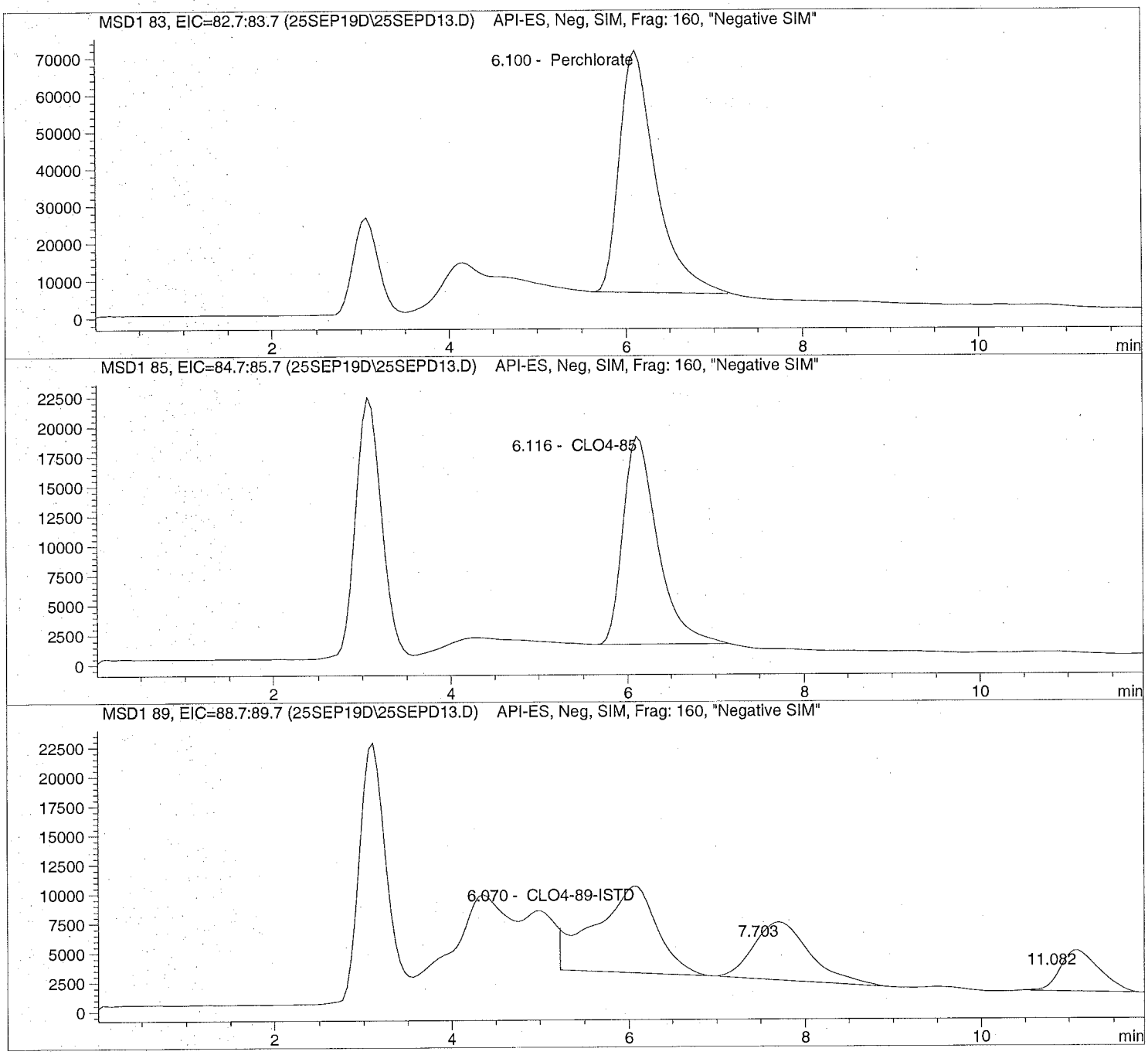
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD13.D Sample Name: 1927207006

Injection Date:	9/25/2019 11:24:03	Seq Line:	13
Sample Name:	1927207006	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD13.D Sample Name: 1927207006

Injection Date:	9/25/2019 11:24:03	Seq Line:	13
Sample Name:	1927207006	Location:	Vial 83
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.100	BBA	1881866.3	18.2810	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.116	PBA	480234.9	15.4085	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.070	BB	361652.6	5.0000	CLO4-89-ISTD
7.703	VBA	216336.8	0.0000	
11.082	PPA	106442.1	0.0000	

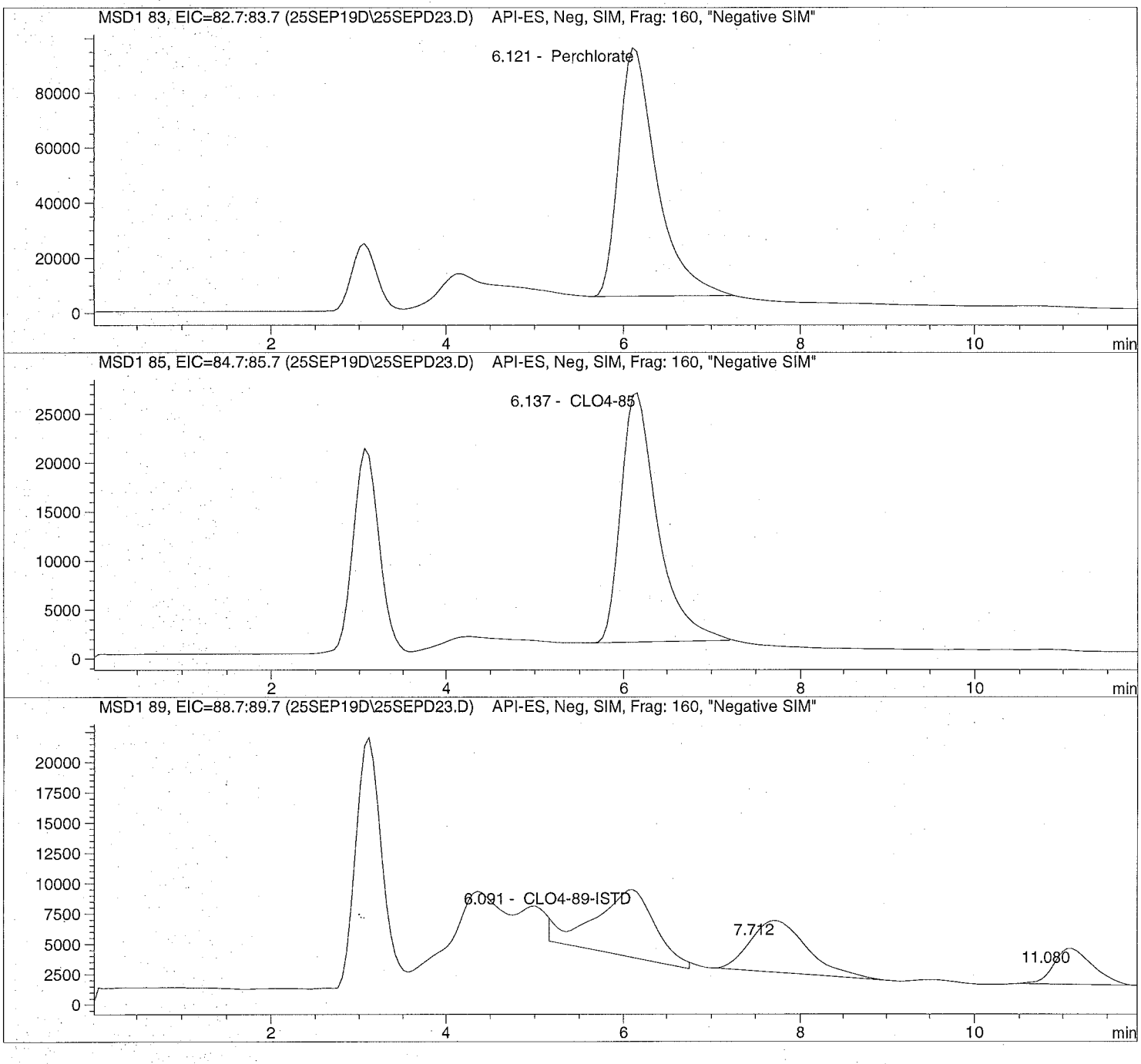
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD23.D Sample Name: 1927207006 MS-25

Injection Date:	9/25/2019 13:43:55	Seq Line:	23
Sample Name:	1927207006 MS-25	Location:	Vial 61
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\25SEP19D\25SEPD23.D Sample Name: 1927207006 MS-25

Injection Date:	9/25/2019 13:43:55	Seq Line:	23
Sample Name:	1927207006 MS-25	Location:	Vial 61
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP3.M
Last Changed: 9/23/2019 12:27:11

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Mon, 23. Sep. 2019,00:20:59 pm
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	0.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.121	PBA	2732867.5	34.3055	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.137	PBA	747215.8	31.2167	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
6.091	BBA	262065.2	5.0000	CLO4-89-ISTD
7.712	PBA	189169.8	0.0000	
11.080	PBA	89782.7	0.0000	

*** End of Report ***

HS19090860 8260

ALS WO# HS19090860

MSVOA06 -Logbook

Batch: 37649
Date: 09-24-2019
Method: 8260 ICAL
Comments:

Analyst: Devak Giga
Reviewer:
Laboratory: Houston

#	Samp ID	Type	Analyzed	DF	Init Wt/Vol	Final Vol	File ID	Matrix	Status	pH
1	BFB	TUNE	09-24-2019 10:48 am	1.00	0.00 mL	0.00 mL	X092401.D	Liquid	Y	NA
	Auto find/purged									
2	VSTD000.25	ICAL1	09-24-2019 11:12 am	1.00	5.00 mL	0.00 mL	X092402.D	Liquid	Y	NA
3	VSTD000.5	ICAL2	09-24-2019 11:36 am	1.00	5.00 mL	0.00 mL	X092403.D	Liquid	Y	NA
4	VSTD001	ICAL3	09-24-2019 12:23 pm	1.00	5.00 mL	0.00 mL	X092404.D	Liquid	Y	NA
5	VSTD002	ICAL4	09-24-2019 12:47 pm	1.00	5.00 mL	0.00 mL	X092405.D	Liquid	Y	NA
6	VSTD005	ICAL5	09-24-2019 01:11 pm	1.00	5.00 mL	0.00 mL	X092406.D	Liquid	Y	NA
7	VSTD020	ICAL6	09-24-2019 01:35 pm	1.00	5.00 mL	0.00 mL	X092407.D	Liquid	Y	NA
8	VSTD050	ICAL7	09-24-2019 01:59 pm	1.00	5.00 mL	0.00 mL	X092408.D	Liquid	Y	NA
9	VSTD100	ICAL8	09-24-2019 02:23 pm	1.00	5.00 mL	0.00 mL	X092409.D	Liquid	Y	NA
10	VSTD150	ICAL9	09-24-2019 02:47 pm	1.00	5.00 mL	0.00 mL	X092410.D	Liquid	Y	NA
11	VSTD200	ICAL	09-24-2019 03:11 pm	1.00	5.00 mL	0.00 mL	X092411.D	Liquid	Y	NA
12	BLANK	SAMP	09-24-2019 03:35 pm	1.00	5.00 mL	0.00 mL	X092412.D	Liquid	Y	NA
	Cleanup blk									
13	BLANK	SAMP	09-24-2019 03:59 pm	1.00	5.00 mL	0.00 mL	X092413.D	Liquid	Y	NA
	Cleanup blk									
14	ICV	ICV	09-24-2019 04:23 pm	1.00	5.00 mL	0.00 mL	X092414.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									
15	BLANK	SAMP	09-24-2019 04:47 pm	1.00	5.00 mL	0.00 mL	X092415.D	Liquid	Y	NA
	Cleanup blk									
16	CCB	SAMP	09-24-2019 05:11 pm	1.00	5.00 mL	0.00 mL	X092416.D	Liquid	Y	NA
	CCB									
17	VLCSW-190924	LCS	09-24-2019 05:35 pm	1.00	5.00 mL	0.00 mL	X092417.D	Liquid	Y	NA
	4 uL LCS std/50 mL DI									
18	BLK	SAMP	09-24-2019 05:59 pm	1.00	5.00 mL	0.00 mL	X092418.D	Liquid	Y	NA
	Cleanup blk									
19	VBLKW-190924	MBLK	09-24-2019 06:23 pm	1.00	5.00 mL	0.00 mL	X092419.D	Liquid	Y	NA
20	HS19090860-01	SAMP	09-24-2019 06:47 pm	1.00	5.00 mL	0.00 mL	X092420.D	Liquid	Y	<2
21	HS19090860-02	SAMP	09-24-2019 07:11 pm	25.00	5.00 mL	0.00 mL	X092421.D	Liquid	Y	<2
22	HS19090860-01MS	MS	09-24-2019 07:35 pm	1.00	5.00 mL	0.00 mL	X092422.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
23	HS19090860-01MSD	MSD	09-24-2019 07:59 pm	1.00	5.00 mL	0.00 mL	X092423.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
24	HS19090860-02	SAMP	09-24-2019 08:23 pm	250.0(	5.00 mL	0.00 mL	X092424.D	Liquid	Y	<2
25	HS19090860-05	SAMP	09-24-2019 08:47 pm	1.00	5.00 mL	0.00 mL	X092425.D	Liquid	Y	<2
26	HS19090860-08	SAMP	09-24-2019 09:11 pm	1.00	5.00 mL	0.00 mL	X092426.D	Liquid	Y	<2
~~27~~	~~HS19090860-11~~	~~SAMP~~	~~09-24-2019 09:36 pm~~	~~1.00~~	~~5.00 mL~~	~~0.00 mL~~	~~X092427.D~~	~~Liquid~~	~~Y~~	~~<2~~
28	HS19090860-12	SAMP	09-24-2019 10:00 pm	1.00	5.00 mL	0.00 mL	X092428.D	Liquid	Y	<2
29	CCV-END	CCV	09-24-2019 10:24 pm	1.00	5.00 mL	0.00 mL	X092429.D	Liquid	Y	NA
	~~*10 uL cal std/50 mL DI*~~									

MSVOA06 -Logbook

Chemical	Value
SURR SPK ID	30502-94-03
IS ID	30502-94-04
ICV STD ID	30603-84-01
LCS/MS ID	30603-84-01
CAL STD ID	30502-94-01/02
BFB Ion 95 Response	
BFB ID	30502-94-03
pH Paper	634-64-11

FORM 2
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

	CLIENT SAMPLE NO.	SMC1 (TOL) #	SMC2 #	SMC3 (DCE) #	OTHER #	TOT OUT
01	VLCSW-190924	92	105	104	104	0
02	VBLKW-190924	98	104	91	94	0
03	HS19090860-0	98	103	91	94	0
04	HS19090860-0	97	104	91	94	0
05	HS19090860-0	100	102	92	96	0
06	HS19090860-0	98	104	91	95	0
07	HS19090860-0	101	104	92	94	0
08	HS19090860-0	99	106	91	94	0
09	HS19090860-0	98	106	92	95	0
10	HS19090860-1	99	103	91	94	0
11	HS19090860-1	98	104	91	94	0
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(70-130)
SMC2	= 4-Bromofluorobenzene	(70-130)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(70-130)
OTHER	= Dibromofluoromethane	(70-130)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 3
WATER VOLATILE METHOD SPIKE RECOVERY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Matrix Spike - Sample No.: ICV

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE AMOUNT ()	% REC #	QC. LIMITS REC.
cis-1,2-Dichloroethene	50.00	45.36	91	80-120
1,2-Dichloroethane	50.00	46.75	94	80-120
Vinyl Chloride	50.00	45.29	90	80-120
1,1,2-Trichloroethane	50.00	50.91	102	80-120
Methylene Chloride	50.00	49.74	99	80-120
1,1-Dichloroethene	50.00	44.61	89	80-120
Trichloroethene	50.00	44.46	89	80-120

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

COMMENTS:

FORM III VOA

FORM 4
VOLATILE METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

VBLKW-190924

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092419 Lab Sample ID: VBLKW-190924

Date Analyzed: 09/24/19 Time Analyzed: 1823

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: VOA6

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCSW-190924	VLCSW-190924	X092417	1735
02	HS19090860-0	HS19090860-01	X092420	1847
03	HS19090860-0	HS19090860-02	X092421	1911
04	HS19090860-0	HS19090860-01M	X092422	1935
05	HS19090860-0	HS19090860-01M	X092423	1959
06	HS19090860-0	HS19090860-02	X092424	2023
07	HS19090860-0	HS19090860-05	X092425	2047
08	HS19090860-0	HS19090860-08	X092426	2111
09	HS19090860-1	HS19090860-11	X092427	2136
10	HS19090860-1	HS19090860-12	X092428	2200
11				
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COMMENTS:

FORM 5
VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092401 BFB Injection Date: 09/24/19

Instrument ID: VOA6 BFB Injection Time: 1048

GC Column: DB624 ID: 0.25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	19.0
75	30.0 - 60.0% of mass 95	49.7
95	Base Peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.4 (0.7)1
174	Greater than 50.0% of mass 95	61.6
175	5.0 - 9.0% of mass 174	5.0 (8.1)1
176	95.0 - 101.0% of mass 174	59.0 (95.7)1
177	5.0 - 9.0% of mass 176	4.5 (7.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD000.25	VSTD000.25	X092402	09/24/19	1112
02	VSTD000.5	VSTD000.5	X092403	09/24/19	1136
03	VSTD001	VSTD001	X092404	09/24/19	1223
04	VSTD002	VSTD002	X092405	09/24/19	1247
05	VSTD005	VSTD005	X092406	09/24/19	1311
06	VSTD020	VSTD020	X092407	09/24/19	1335
07	VSTD050	VSTD050	X092408	09/24/19	1359
08	VSTD100	VSTD100	X092409	09/24/19	1423
09	VSTD150	VSTD150	X092410	09/24/19	1447
10	VSTD200	VSTD200	X092411	09/24/19	1511
11	ICV	ICV	X092414	09/24/19	1623
12	VLCSW-190924	VLCSW-190924	X092417	09/24/19	1735
13	VBLKW-190924	VBLKW-190924	X092419	09/24/19	1823
14	HS19090860-0	HS19090860-01	X092420	09/24/19	1847
15	HS19090860-0	HS19090860-02	X092421	09/24/19	1911
16	HS19090860-0	HS19090860-01M	X092422	09/24/19	1935
17	HS19090860-0	HS19090860-01M	X092423	09/24/19	1959
18	HS19090860-0	HS19090860-02	X092424	09/24/19	2023
19	HS19090860-0	HS19090860-05	X092425	09/24/19	2047
20	HS19090860-0	HS19090860-08	X092426	09/24/19	2111
21	HS19090860-1	HS19090860-11	X092427	09/24/19	2136
22	HS19090860-1	HS19090860-12	X092428	09/24/19	2200

FORM 5
VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092401 BFB Injection Date: 09/24/19

Instrument ID: VOA6 BFB Injection Time: 1048

GC Column: DB624 ID: 0.25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	19.0
75	30.0 - 60.0% of mass 95	49.7
95	Base Peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.4 (0.7)1
174	Greater than 50.0% of mass 95	61.6
175	5.0 - 9.0% of mass 174	5.0 (8.1)1
176	95.0 - 101.0% of mass 174	59.0 (95.7)1
177	5.0 - 9.0% of mass 176	4.5 (7.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	CCV-END	CCV-END	X092429	09/24/19	2224
02					
03					
04					
05					
06					
07					
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22					

FORM 6
VOLATILE INITIAL CALIBRATION DATA

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date(s): 09/24/19 09/24/19

Column: DB624 ID: 0.18 (mm) Calibration Time(s): 1112 1511

LAB FILE ID: RF0.25: X092402 RF0.5: X092403 RF1: X092404
RF2: X092405 RF5: X092406 RF20: X092407

COMPOUND	RF0.25	RF0.5	RF1	RF2	RF5	RF20
1,2-Dichloroethane		0.572	0.460	0.492	0.471	0.444
Vinyl Chloride		0.765	0.626	0.626	0.599	0.559
1,1,2-Trichloroethane		2819	4547	7961	21561	72743
Methylene Chloride		7457	9629	14182	29957	97780
1,1-Dichloroethene		0.562	0.432	0.426	0.422	0.387
Trichloroethene		0.519	0.387	0.376	0.376	0.346
Toluene-d8		1.753	1.561	1.408	1.480	1.347
4-Bromofluorobenzene		5086	8451	14730	35795	123917
1,2-Dichloroethane-d4		4097	6313	11919	28682	103005
Dibromofluoromethane		2791	4969	8916	25838	89138

FORM 6
VOLATILE INITIAL CALIBRATION DATA

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS1909086

Instrument ID: VOA6 Calibration Date(s): 09/24/19 09/24/19

Column: DB624 ID: 0.18 (mm) Calibration Time(s): 1112 1511

LAB FILE ID: RF50: X092408 RF100: X092409 RF150: X092410
RF200: X092411

COMPOUND	RF50	RF100	RF150	RF200
1,2-Dichloroethane	0.423	0.451	0.440	0.436
Vinyl Chloride	0.574	0.668	0.646	0.633
1,1,2-Trichloroethane	171839	329695	458033	587385
Methylene Chloride	225405	435117	608299	766926
1,1-Dichloroethene	0.391	0.444	0.424	0.408
Trichloroethene	0.338	0.371	0.371	0.365
Toluene-d8	1.247	1.313	1.288	1.247
4-Bromofluorobenzene	282942	545858	769184	968135
1,2-Dichloroethane-d4	234244	463426	649926	816407
Dibromofluoromethane	199887	396845	558432	703317

FORM 6
VOLATILE INITIAL CALIBRATION DATA

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS1909086

Instrument ID: VOA6 Calibration Date(s): 09/24/19 09/24/19

Column: DB624 ID: 0.18 (mm) Calibration Time(s): 1112 1511

COMPOUND	CURVE	COEFFICENTS A0	A1	%RSD OR R^2	MAX %RSD OR R^2
1,2-Dichloroethane	AVRG		0.46555932	9.662	15.000
Vinyl Chloride	AVRG		0.63292194	9.516	15.000
1,1,2-Trichloroethane	LINR	-2.02e-002	3.55583352	0.9996535	0.9900000
Methylene Chloride	LINR	-3.42e-002	1.91912003	0.9984093	0.9900000
1,1-Dichloroethene	AVRG		0.43295766	11.982	15.000
Trichloroethene	AVRG		0.38326251	13.901	15.000
Toluene-d8	AVRG		1.40494138	11.984	15.000
4-Bromofluorobenzene	LINR	-2.4e-002	2.14609610	0.9994029	0.9900000
1,2-Dichloroethane-d4	LINR	-1.96e-002	1.79297194	0.9981784	0.9900000
Dibromofluoromethane	LINR	-1.71e-002	2.08368074	0.9983472	0.9900000

FORM 7B
VOLATILE CALIBRATION VERIFICATION SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date: 09/24/19 Time: 2224

Lab File ID: X092429 Init. Calib. Date(s): 09/24/19 09/24/19

Init. Calib. Times: 1112 1511

GC Column: DB624 ID: 0.18 (mm)

COMPOUND	RRF or AMOUNT	RRF50.000 or AMOUNT	CCAL RRF50.000	MIN RRF	%D or %DRIFT	MAX %D or %DRIFT	CURV TYPE
1,2-Dichloroethane	0.4650000	0.4228890	0.4228890	0.1	9.06	50.00	AVRG
Vinyl Chloride	0.6330000	0.5743295	0.5743295	0.1	9.27	50.00	AVRG
1,1,2-Trichloroethane	48.556755	50.000000	0.2922154	0.1	2.89	50.00	LINR
Methylene Chloride	49.079378	50.000000	0.5281255	0.1	1.84	50.00	LINR
1,1-Dichloroethene	0.4330000	0.3906683	0.3906683	0.1	9.78	50.00	AVRG
Trichloroethene	0.3830000	0.3377915	0.3377915	0.2	11.80	50.00	AVRG
Toluene-d8	1.4050000	1.2468812	1.2468812	0.1	11.25	50.00	AVRG
4-Bromofluorobenzene	51.323111	50.000000	0.4811481	0.1	-2.65	50.00	LINR
1,2-Dichloroethane-d4	49.407629	50.000000	0.5488353	0.1	1.18	50.00	LINR
Dibromofluoromethane	50.138913	50.000000	0.4683366	0.1	-0.28	50.00	LINR

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092408 Date Analyzed: 09/24/19

Instrument ID: VOA6 Time Analyzed: 1359

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS1(CBZ) AREA #	RT #	IS2(DCB) AREA #	RT #	IS3(DFB) AREA #	RT #
	12 HOUR STD	588056	7.67	304949	9.67	654978	4.97
	UPPER LIMIT	1176112	8.17	609898	10.17	1309956	5.47
	LOWER LIMIT	294028	7.17	152475	9.17	327489	4.47
	CLIENT SAMPLE NO.						
01	VLCSW-190924	571149	7.67	300403	9.67	631257	4.97
02	VBLKW-190924	696007	7.67	355530	9.67	807277	4.97
03	HS19090860-0	703085	7.67	361280	9.67	809316	4.97
04	HS19090860-0	674697	7.67	349383	9.67	805917	4.97
05	HS19090860-0	629450	7.67	310727	9.67	755092	4.97
06	HS19090860-0	653144	7.67	336239	9.67	753609	4.97
07	HS19090860-0	644878	7.67	324028	9.67	769906	4.97
08	HS19090860-0	680289	7.67	353833	9.67	797051	4.97
09	HS19090860-0	686270	7.67	359783	9.67	809207	4.97
10	HS19090860-1	684132	7.67	350093	9.67	804775	4.97
11	HS19090860-1	684013	7.67	337681	9.67	806567	4.97
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS1 (CBZ) = Chlorobenzene-d5
IS2 (DCB) = 1,4-Dichlorobenzene-d4
IS3 (DFB) = 1,4-Difluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

page 1 of 2

FORM VIII VOA

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092408 Date Analyzed: 09/24/19

Instrument ID: VOA6 Time Analyzed: 1359

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS4 AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	426802	4.18				
	UPPER LIMIT	853604	4.68				
	LOWER LIMIT	213401	3.68				
	CLIENT SAMPLE NO.						
01	VLCSW-190924	403171	4.19				
02	VBLKW-190924	547665	4.19				
03	HS19090860-0	549501	4.18				
04	HS19090860-0	543009	4.18				
05	HS19090860-0	506995	4.18				
06	HS19090860-0	512173	4.18				
07	HS19090860-0	522663	4.18				
08	HS19090860-0	539189	4.18				
09	HS19090860-0	545164	4.18				
10	HS19090860-1	547780	4.18				
11	HS19090860-1	547325	4.18				
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS4 = Pentafluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092401.D

Date : 24-SEP-2019 10:48

Client ID: BFB

Instrument: voa6.i

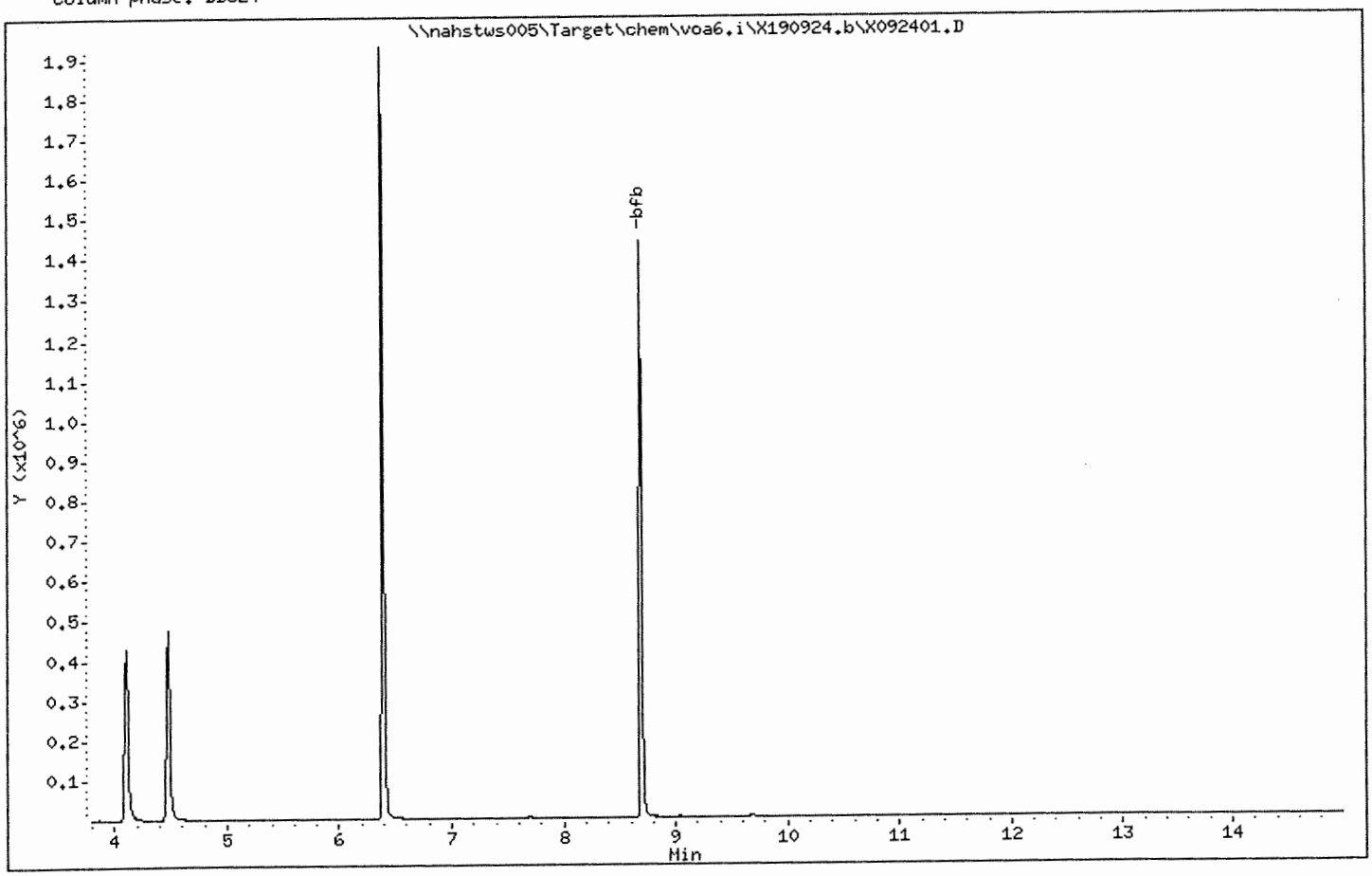
Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092401.D

Date : 24-SEP-2019 10:48

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

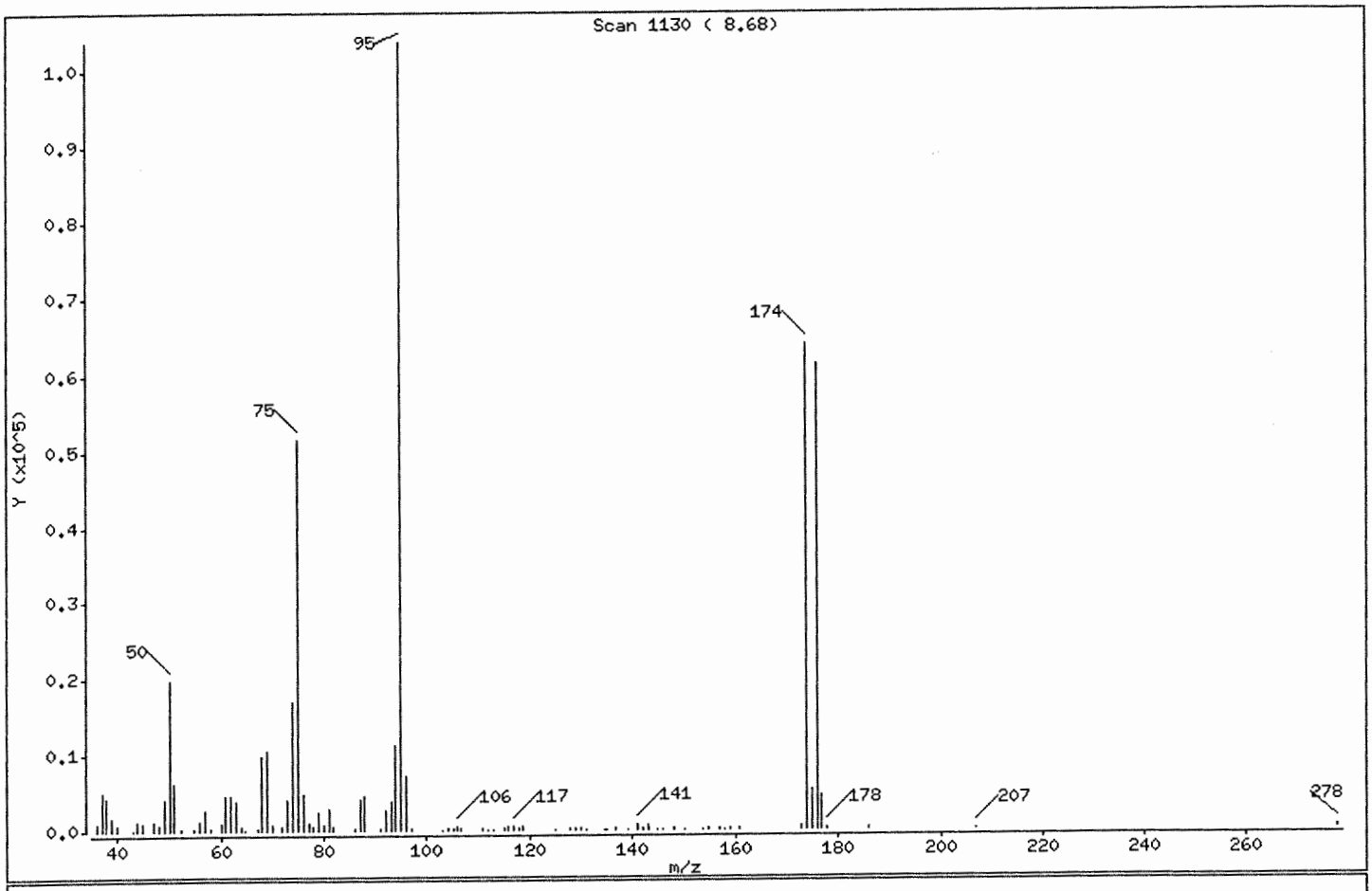
Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

1 bfb



m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
95	Base Peak, 100% relative abundance	100.00
50	15.00 - 40.00% of mass 95	19.04
75	30.00 - 60.00% of mass 95	49.67
96	5.00 - 9.00% of mass 95	7.01
173	Less than 2.00% of mass 174	0.42 (0.68)
174	Greater than 50.00% of mass 95	61.62
175	5.00 - 9.00% of mass 174	4.99 (8.09)
176	95.00 - 101.00% of mass 174	58.98 (95.71)
177	5.00 - 9.00% of mass 176	4.47 (7.57)

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092401.D

Date : 24-SEP-2019 10:48

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

Data File: X092401.D
Spectrum: Scan 1130 (8.68)
Location of Maximum: 95.00
Number of points: 94

m/z	Y	m/z	Y	m/z	Y	m/z	Y
36.00	989	67.10	304	96.90	170	142.00	192
37.00	5113	68.00	9770	103.00	61	143.00	737
38.00	4311	69.00	10453	104.00	357	144.80	84
39.00	1618	70.00	832	105.00	167	145.80	90
40.00	621	72.00	449	105.90	436	147.90	159
43.20	101	73.00	4041	106.70	126	150.10	50
44.00	1149	74.00	16944	110.90	124	153.70	56
45.10	905	75.00	51600	111.80	71	153.90	58
47.00	1223	76.00	4754	112.80	112	154.90	148
48.10	603	77.00	837	115.00	143	156.90	218
49.00	4091	78.00	586	115.80	392	157.90	54
50.10	19776	78.90	2439	116.90	453	158.90	134
51.00	6091	79.90	609	117.90	301	160.90	140
52.20	258	80.90	2777	118.80	416	173.00	436
55.00	271	81.90	480	125.00	60	173.90	64016
56.00	1308	86.00	135	127.90	307	174.90	5179
57.00	2534	87.00	4120	128.90	182	175.90	61272
58.10	144	87.90	4495	129.90	216	176.90	4641
60.00	966	91.00	273	131.00	116	177.90	190
61.00	4455	92.00	2550	134.70	102	185.90	149
62.00	4473	93.00	3732	135.10	90	207.00	70
63.00	3751	94.00	11115	136.80	192	278.20	203
64.00	450	95.00	103888	139.10	59		
64.90	78	96.00	7279	141.00	765		

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092402.D Page 1
Report Date: 09-Oct-2019 18:32

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092402.D
Lab Smp Id: VSTD000.25 Client Smp ID: VSTD000.25
Inj Date : 24-SEP-2019 11:12
Operator : PC Inst ID: voa6.i
Smp Info : VSTD000.25;VSTD000.25;1;1;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 11:12 Cal File: X092402.D
Als bottle: 2 Calibration Sample, Level: 1
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

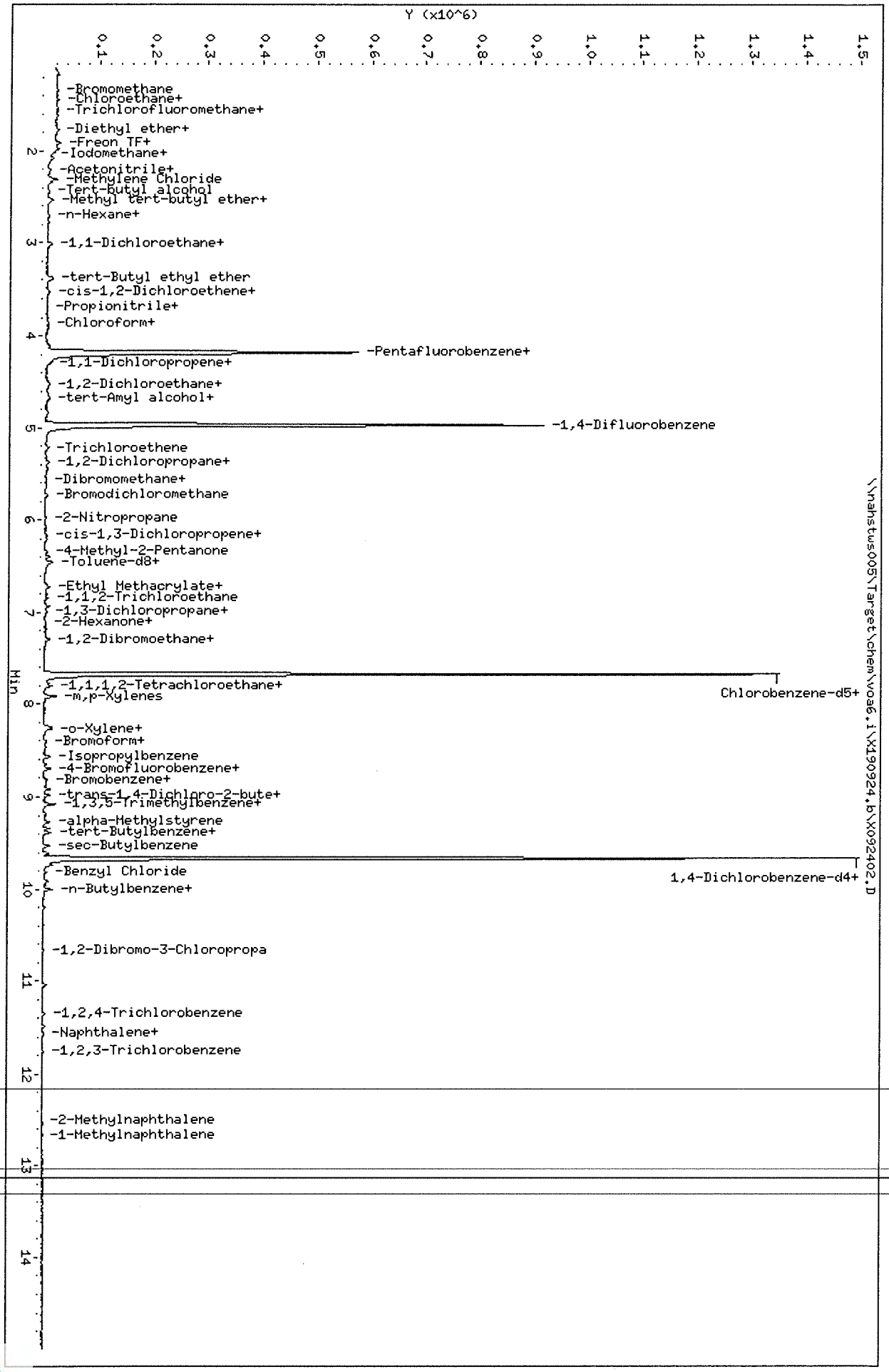
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	1403	0.25000	(a)
11 1,1-Dichloroethene	96	1.912	1.911	(0.457)	1257	0.25000	0.29(aM)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	2408	0.25000	0.33(a)
27 cis-1,2-Dichloroethene	96	3.538	3.530	(0.846)	1911	0.25000	0.31(a)
17 Methylene Chloride	84	2.306	2.305	(0.551)	5284	0.25000	(aM)
38 Trichloroethene	130	5.221	5.214	(1.050)	1927	0.25000	0.33(a)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	1777	0.25000	0.28(aM)
$ 35 1,2-Dichloroethane-d4	65	4.483	4.476	(1.072)	1873	0.25000	(Ta)
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	3915	0.25000	(a)
$ 30 Dibromofluoromethane	113	4.111	4.103	(0.983)	1509	0.25000	(a)
$ 48 Toluene-d8	98	6.396	6.388	(0.834)	6823	0.25000	0.35(aM)
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	492249	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	760854	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	675193	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	352735	50.0000	

QC Flag Legend

T - Target compound detected outside RT window.
a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).
M - Compound response manually integrated.

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092402.D
Date : 24-SEP-2019 11:12
Client ID: VSTD000.25
Sample Info: VSTD000.25;VSTD000.25;1;1;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092403.D
Lab Smp Id: VSTD000.5 Client Smp ID: VSTD000.5
Inj Date : 24-SEP-2019 11:36
Operator : PC Inst ID: voa6.i
Smp Info : VSTD000.5;VSTD000.5;1;2;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 11:36 Cal File: X092403A.D
Als bottle: 3 Calibration Sample, Level: 2
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

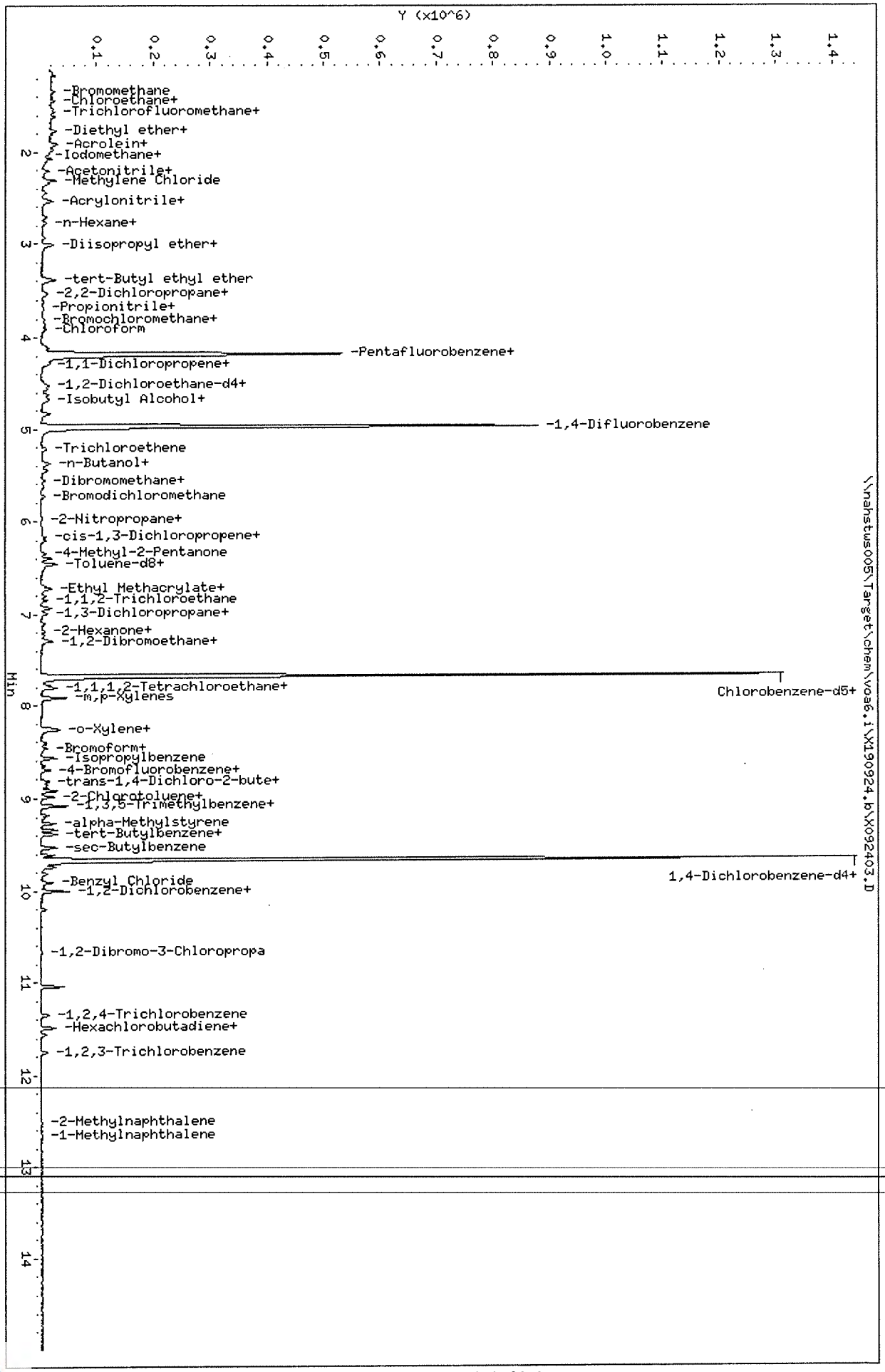
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	2819	0.50000	(a)
11 1,1-Dichloroethene	96	1.911	1.911	(0.456)	2583	0.50000	0.64(aM)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	4143	0.50000	0.61(aM)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	3607	0.50000	0.63(aM)
17 Methylene Chloride	84	2.305	2.305	(0.550)	7457	0.50000	(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	3759	0.50000	0.67(a)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	3517	0.50000	0.60(aM)
$ 35 1,2-Dichloroethane-d4	65	4.483	4.476	(1.070)	4097	0.50000	(a)
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	5086	0.50000	(a)
$ 30 Dibromofluoromethane	113	4.118	4.103	(0.983)	2791	0.50000	(a)
$ 48 Toluene-d8	98	6.395	6.388	(0.834)	11368	0.50000	0.62(a)
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	459462	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	723680	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.678	(1.000)	648488	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	339469	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).
M - Compound response manually integrated.

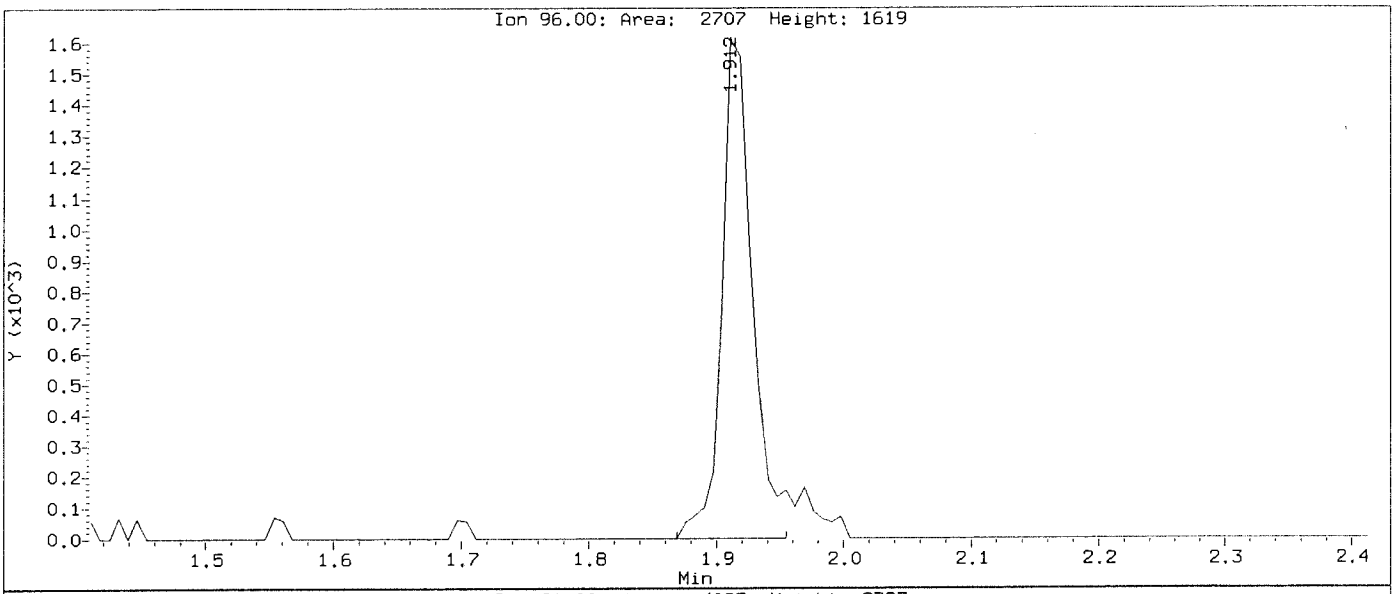
Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092403.D
Date : 24-SEP-2019 11:36
Client ID: VSTD000.5
Sample Info: VSTD000.5;VSTD000.5;1;2;
Purge Volume: 5.0
Column phase: DB624

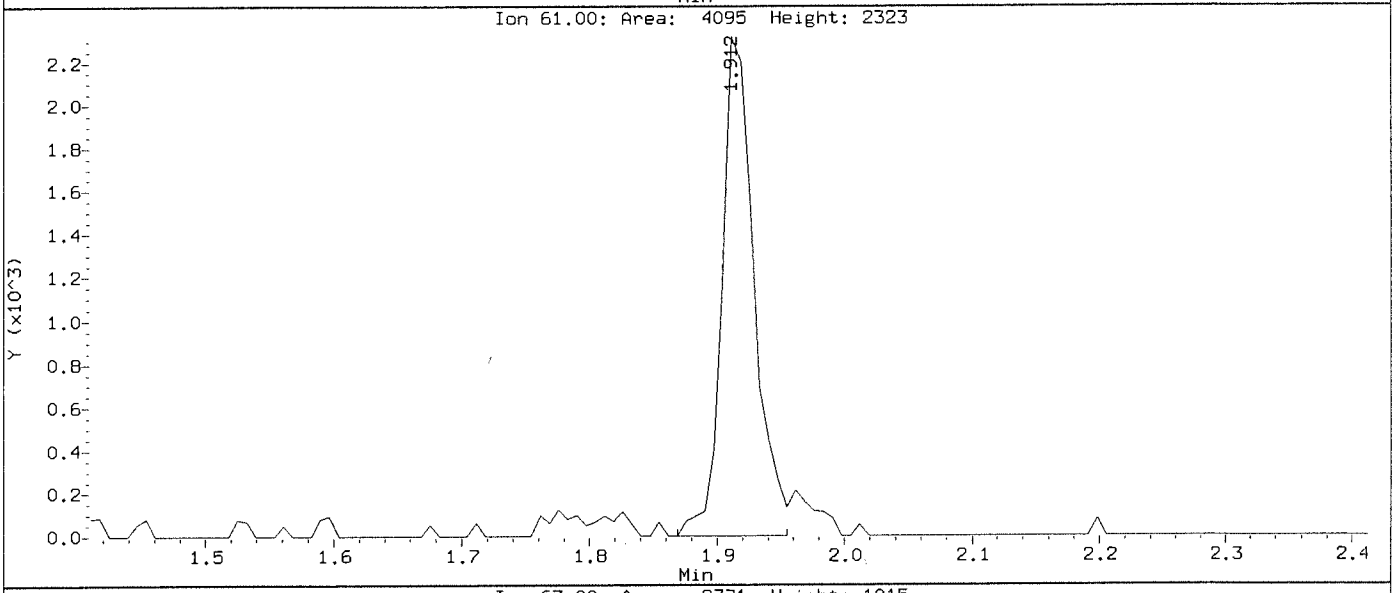
Instrument: voa6.i
Operator: PC
Column diameter: 0.18

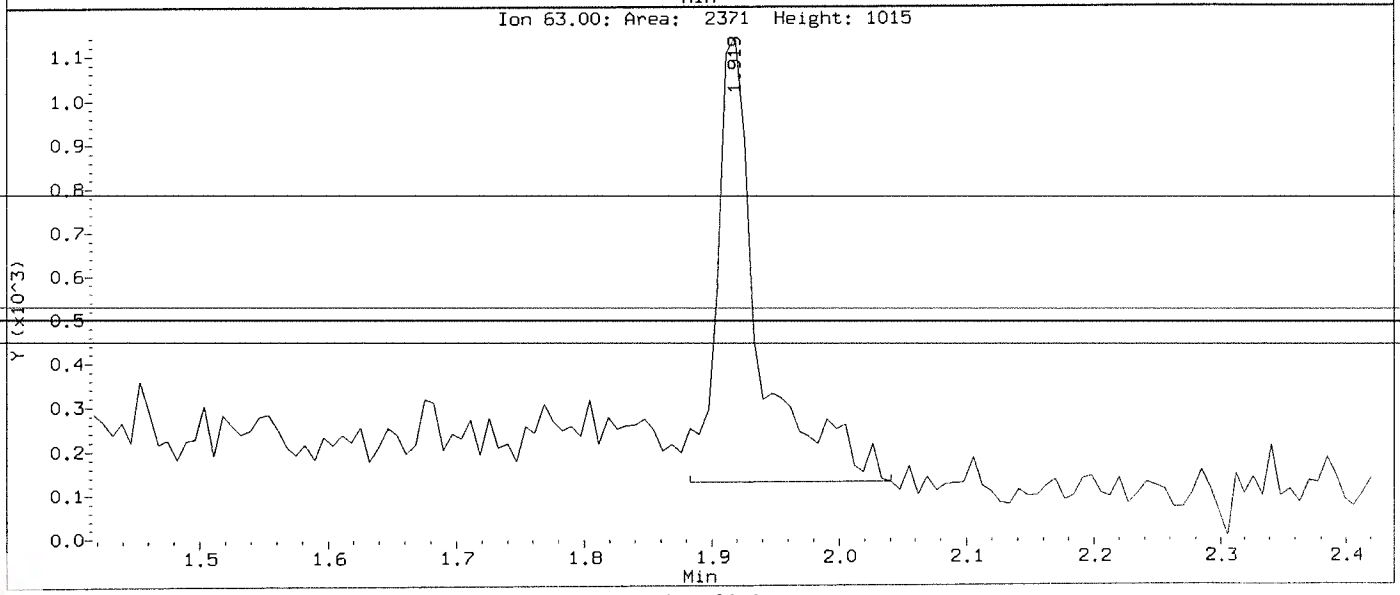


Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\BEFORE2\X092403.D
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

Compound: 1,1-Dichloroethene
CAS Number: 75-35-4







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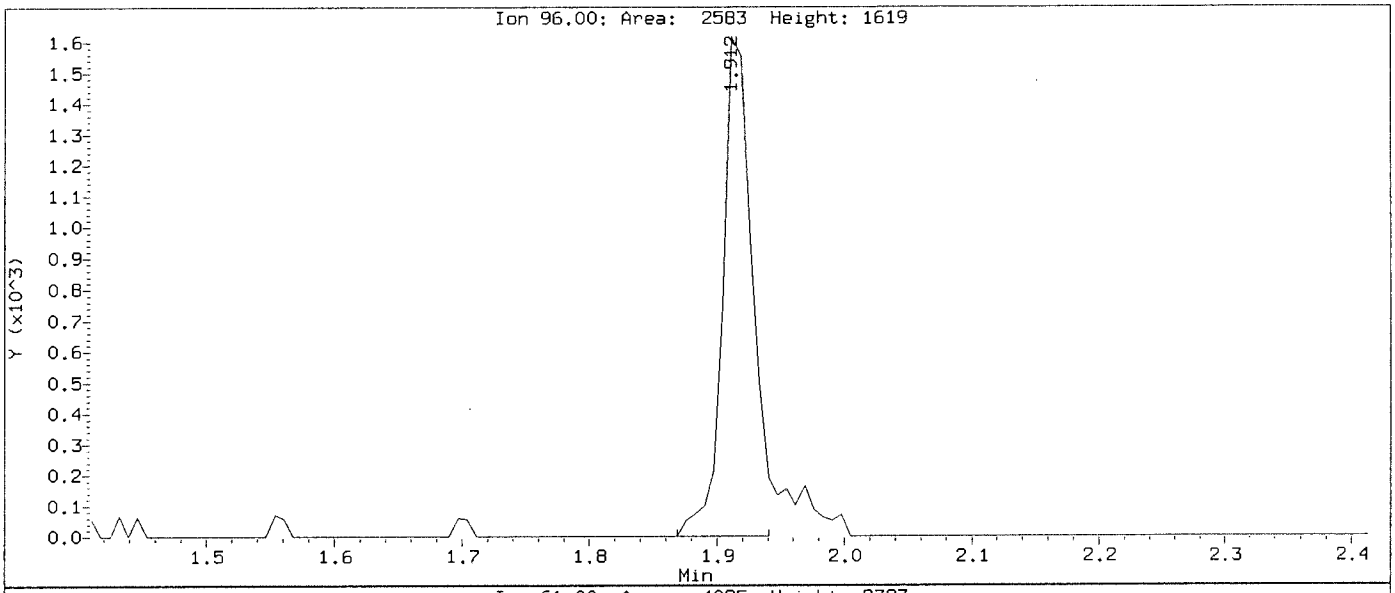
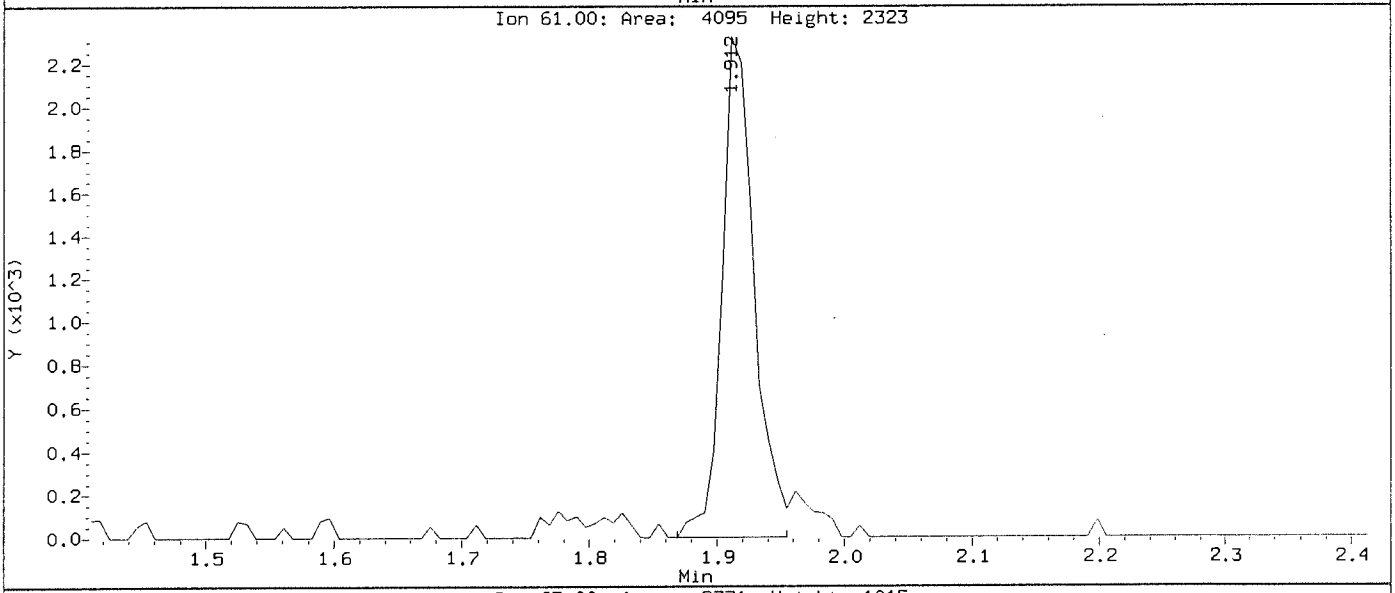
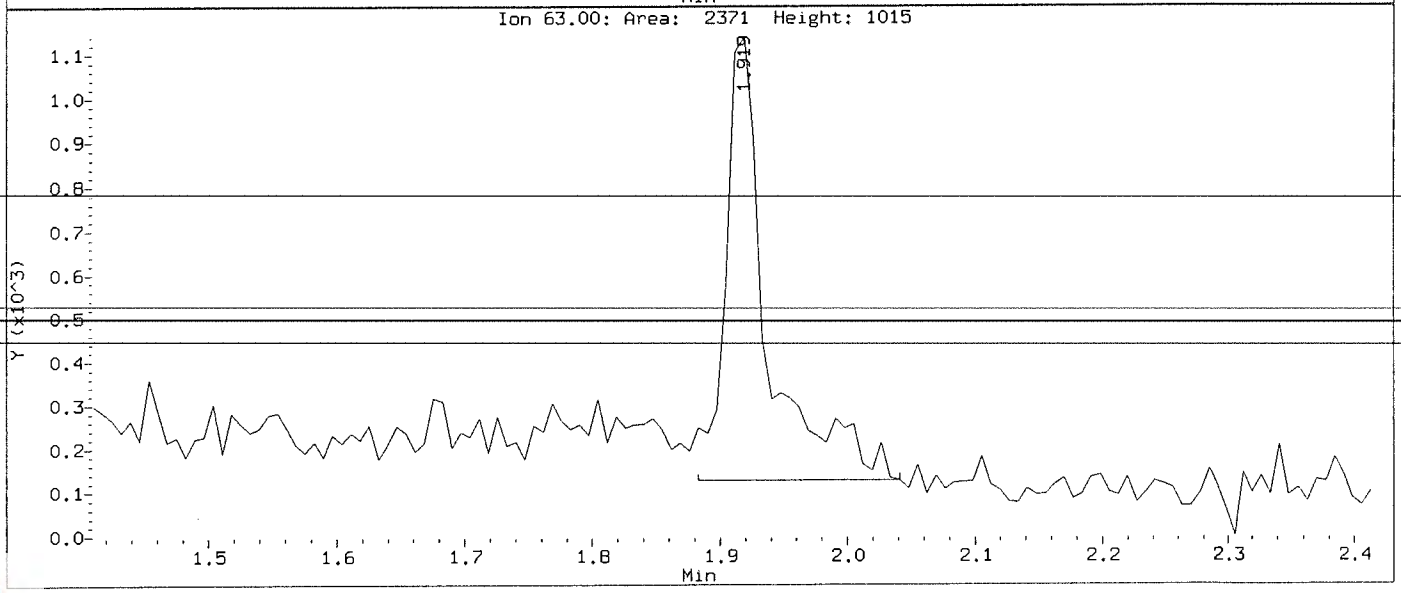
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

Compound: 1,1-Dichloroethene
CAS Number: 75-35-4







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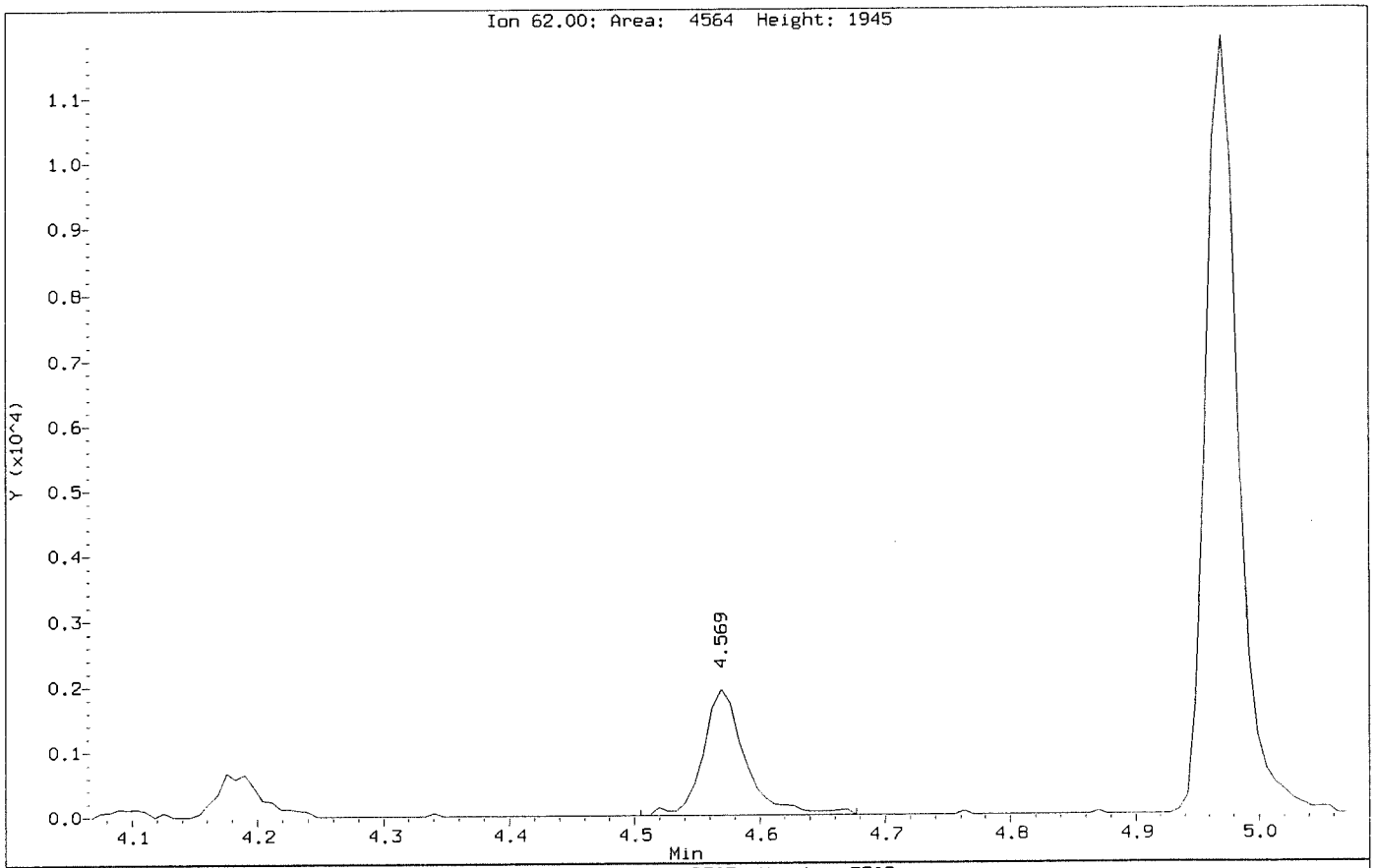
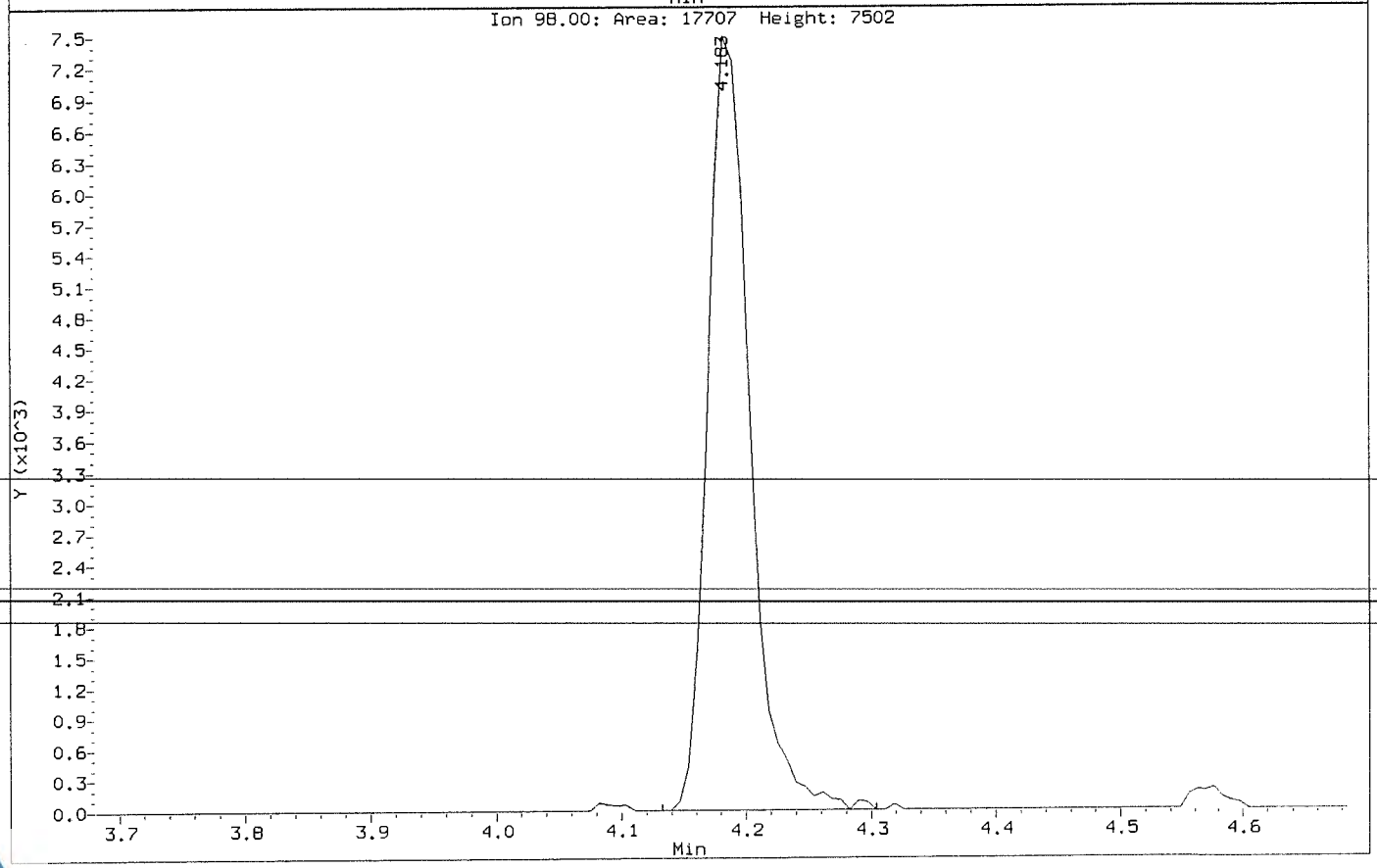
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

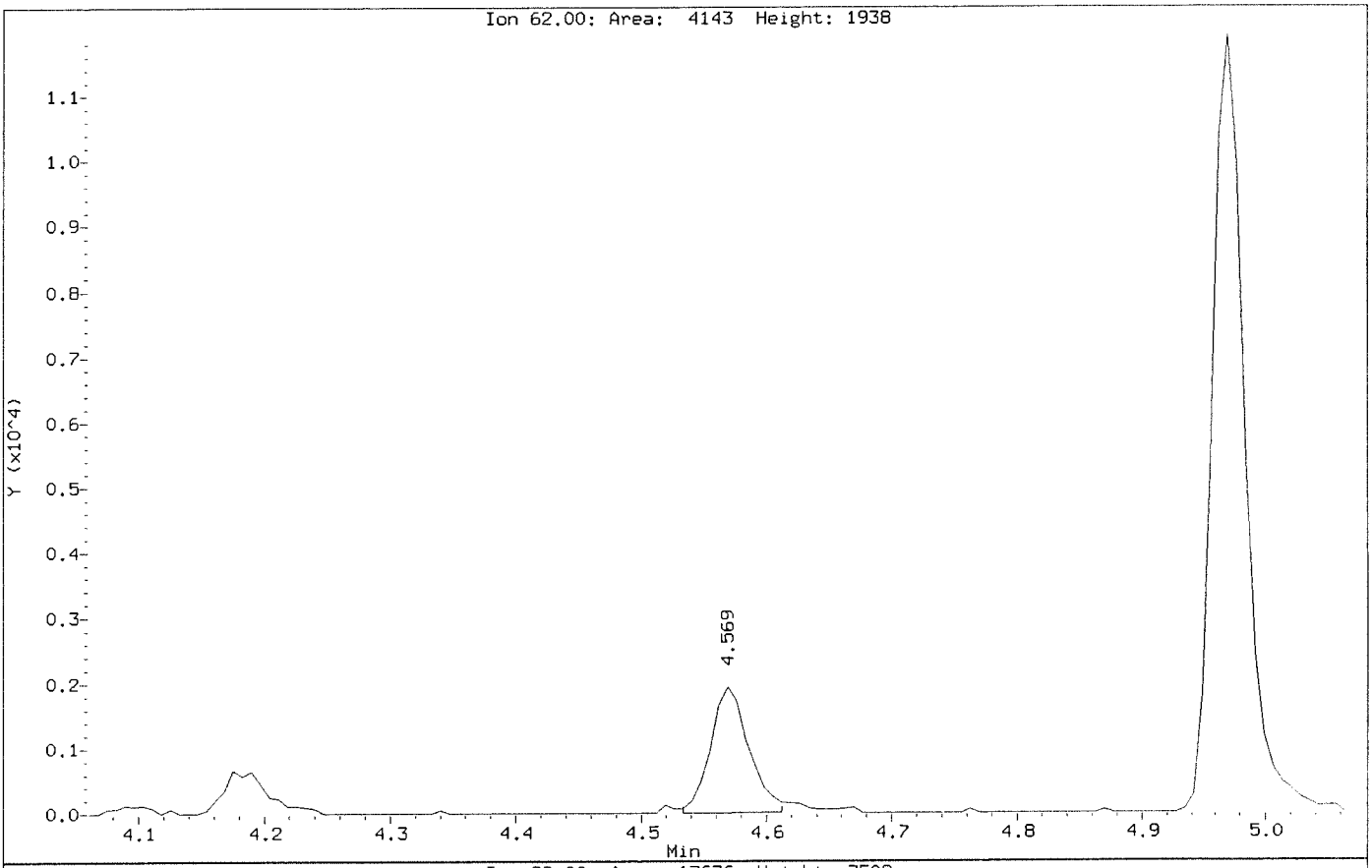
Compound: 1,2-Dichloroethane
CAS Number: 107-06-2

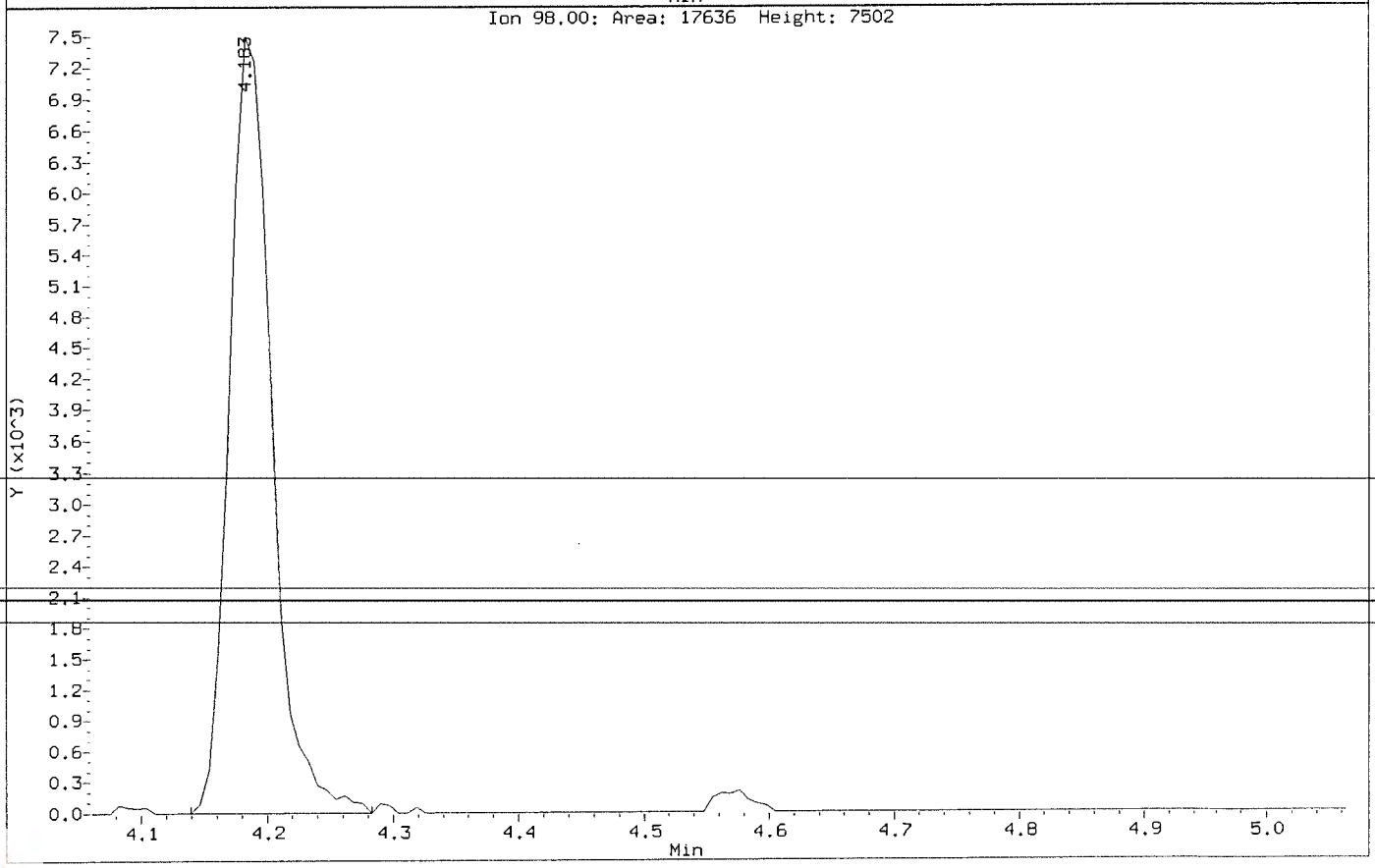




Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092403.D
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

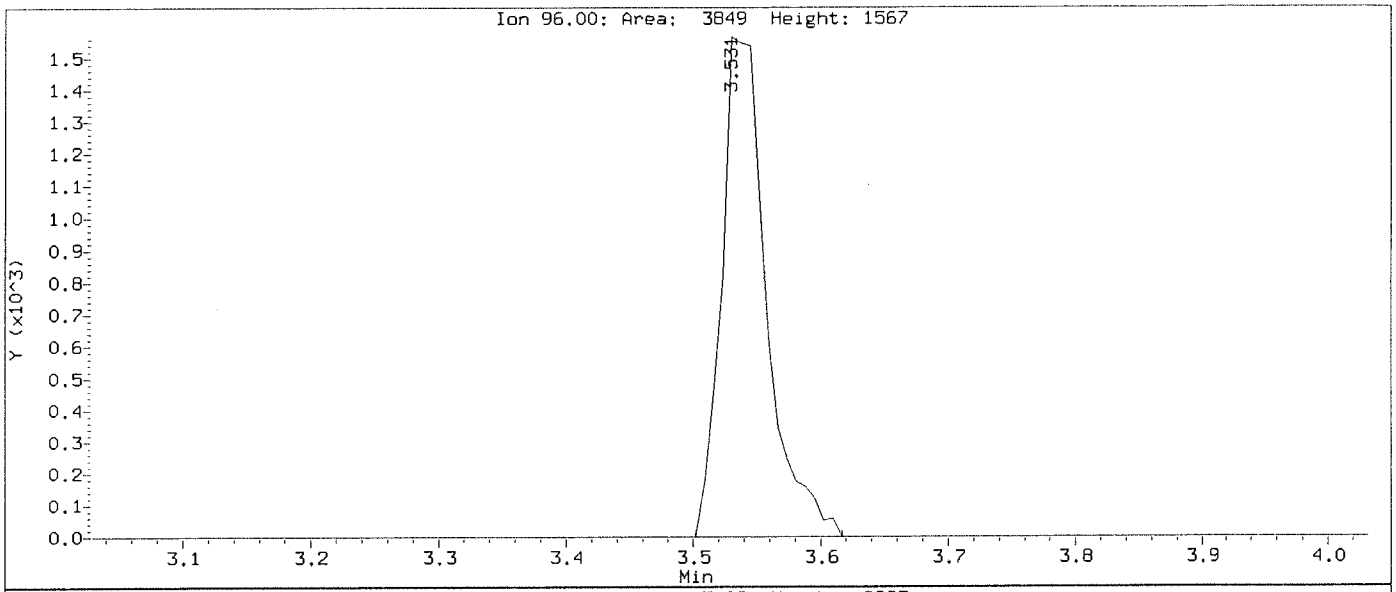
Compound: 1,2-Dichloroethane
CAS Number: 107-06-2

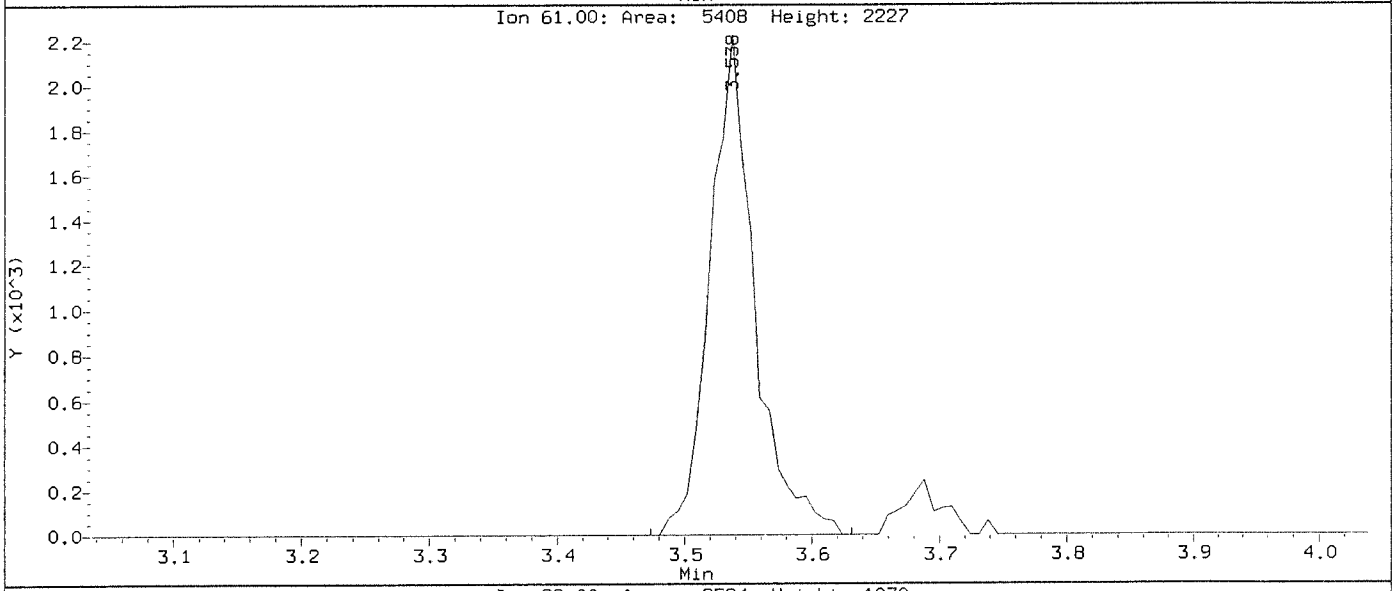


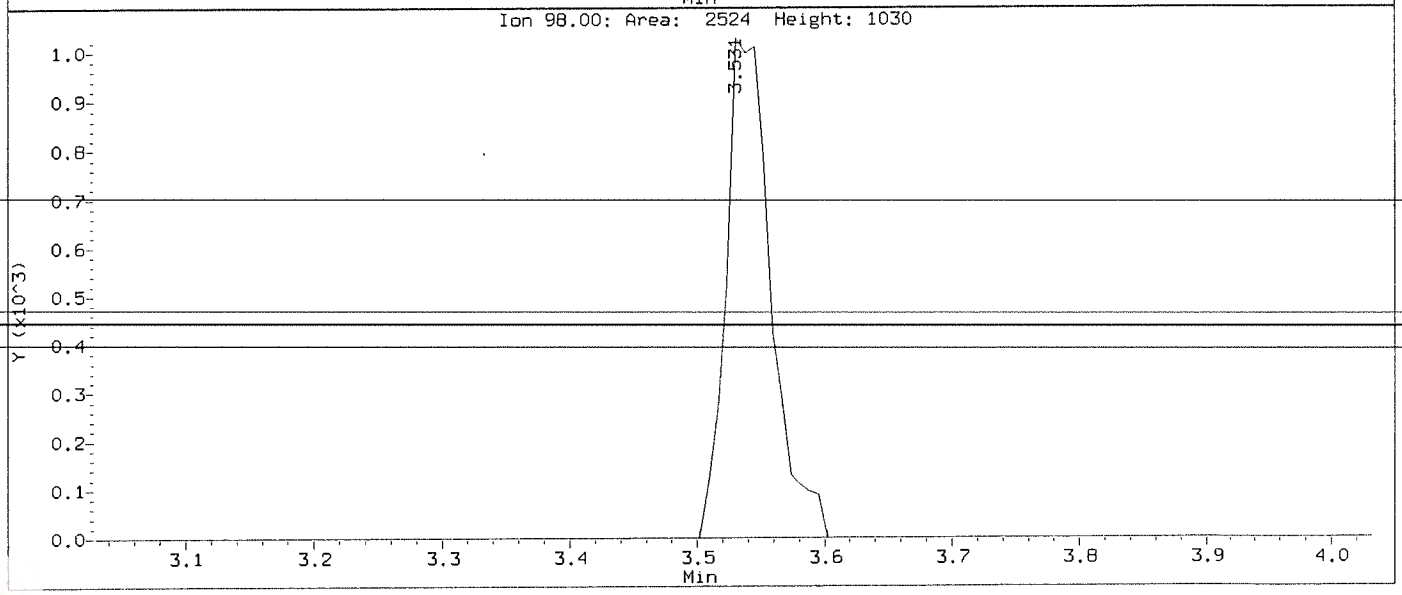


Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\BEFORE2\X092403.D
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

Compound: cis-1,2-Dichloroethene
CAS Number: 156-59-2







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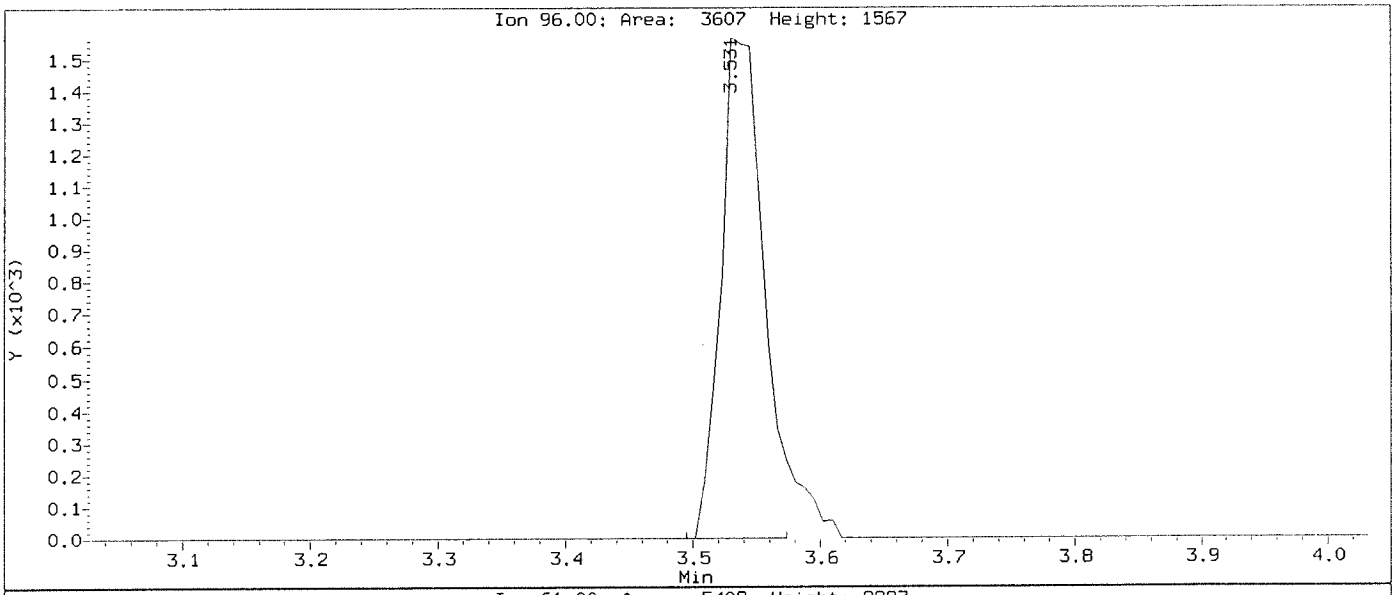
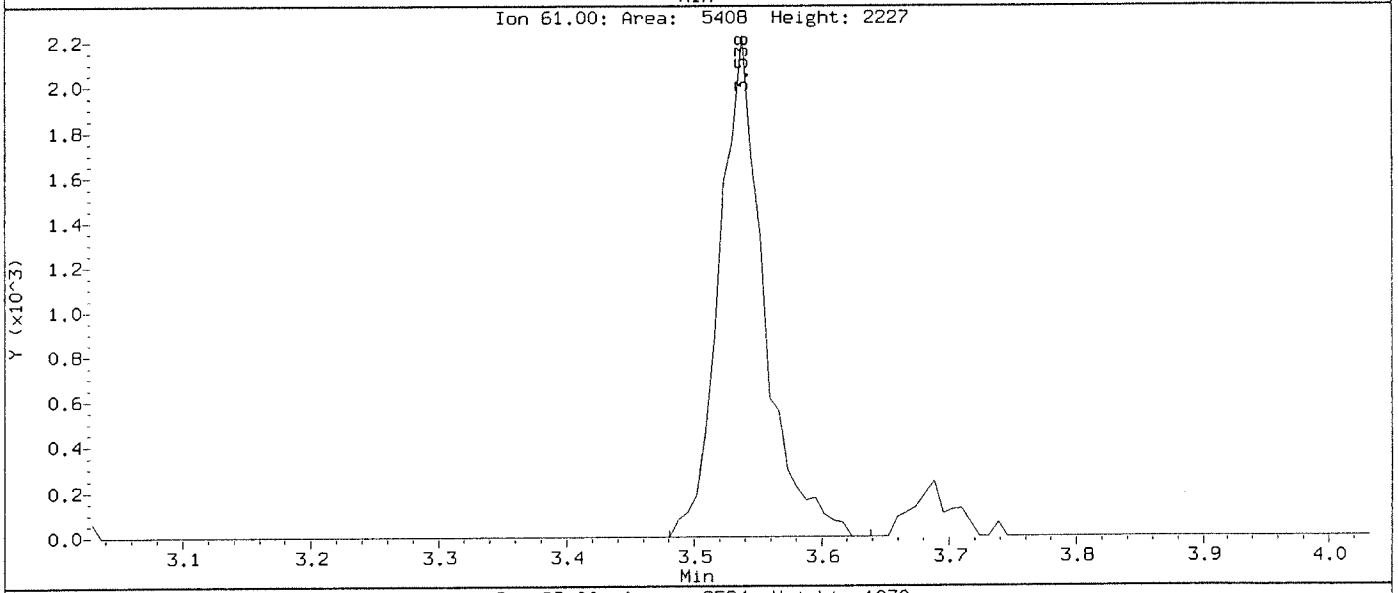
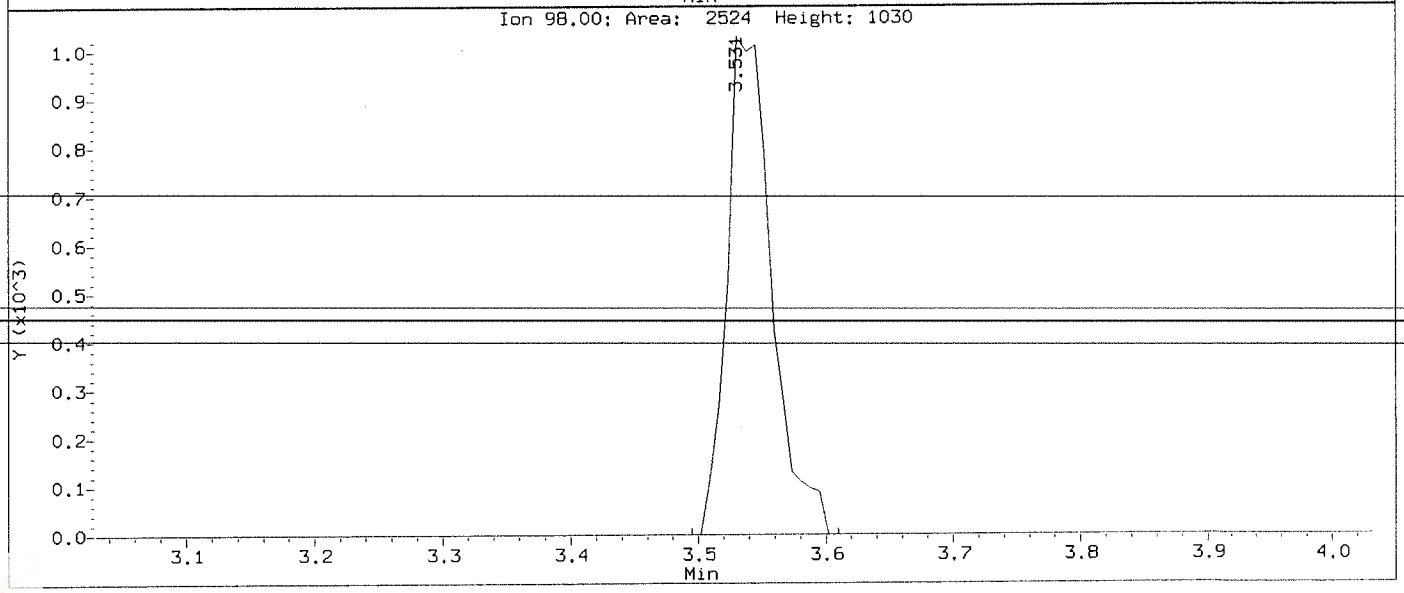
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

Compound: cis-1,2-Dichloroethene
CAS Number: 156-59-2

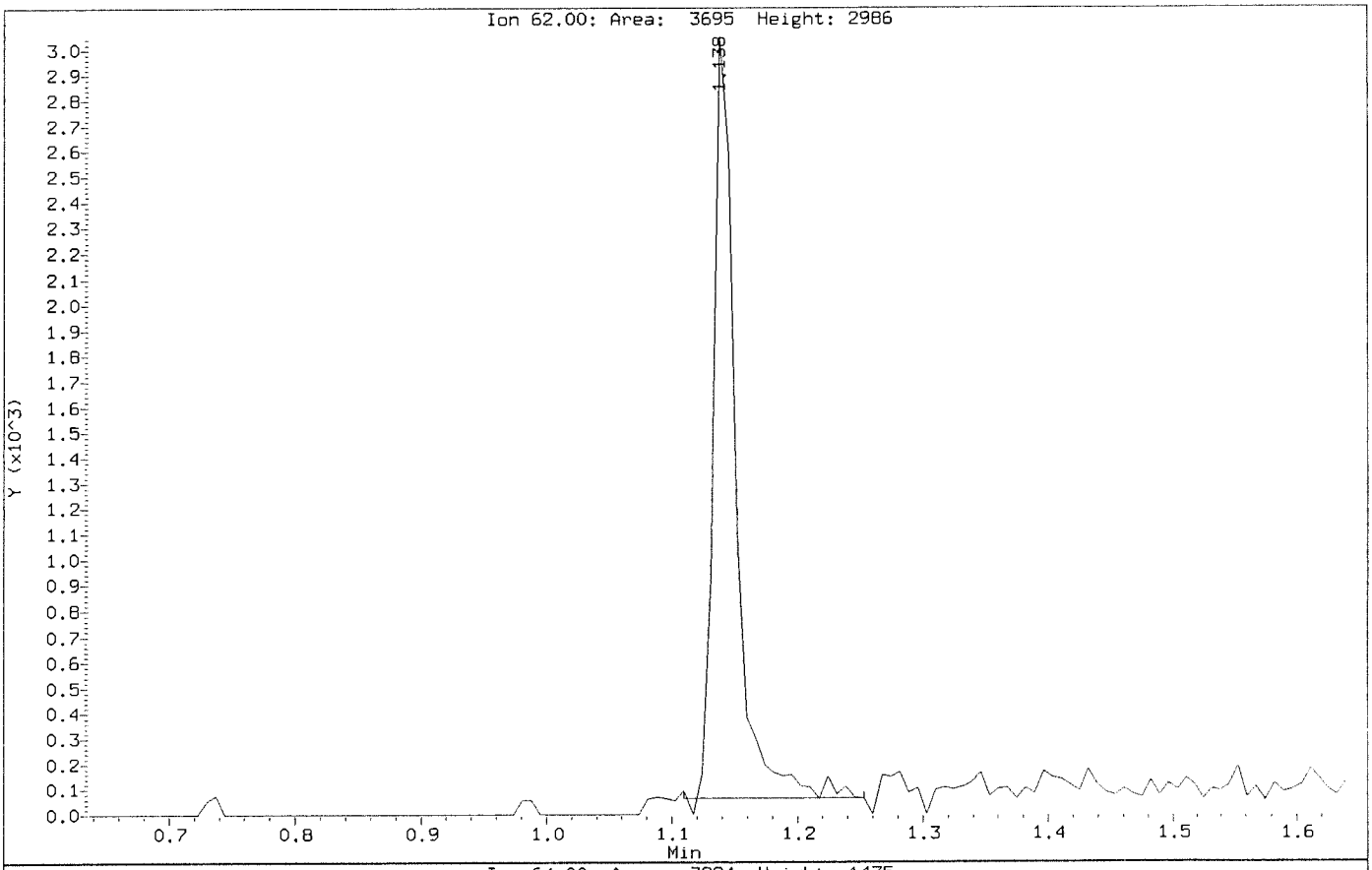


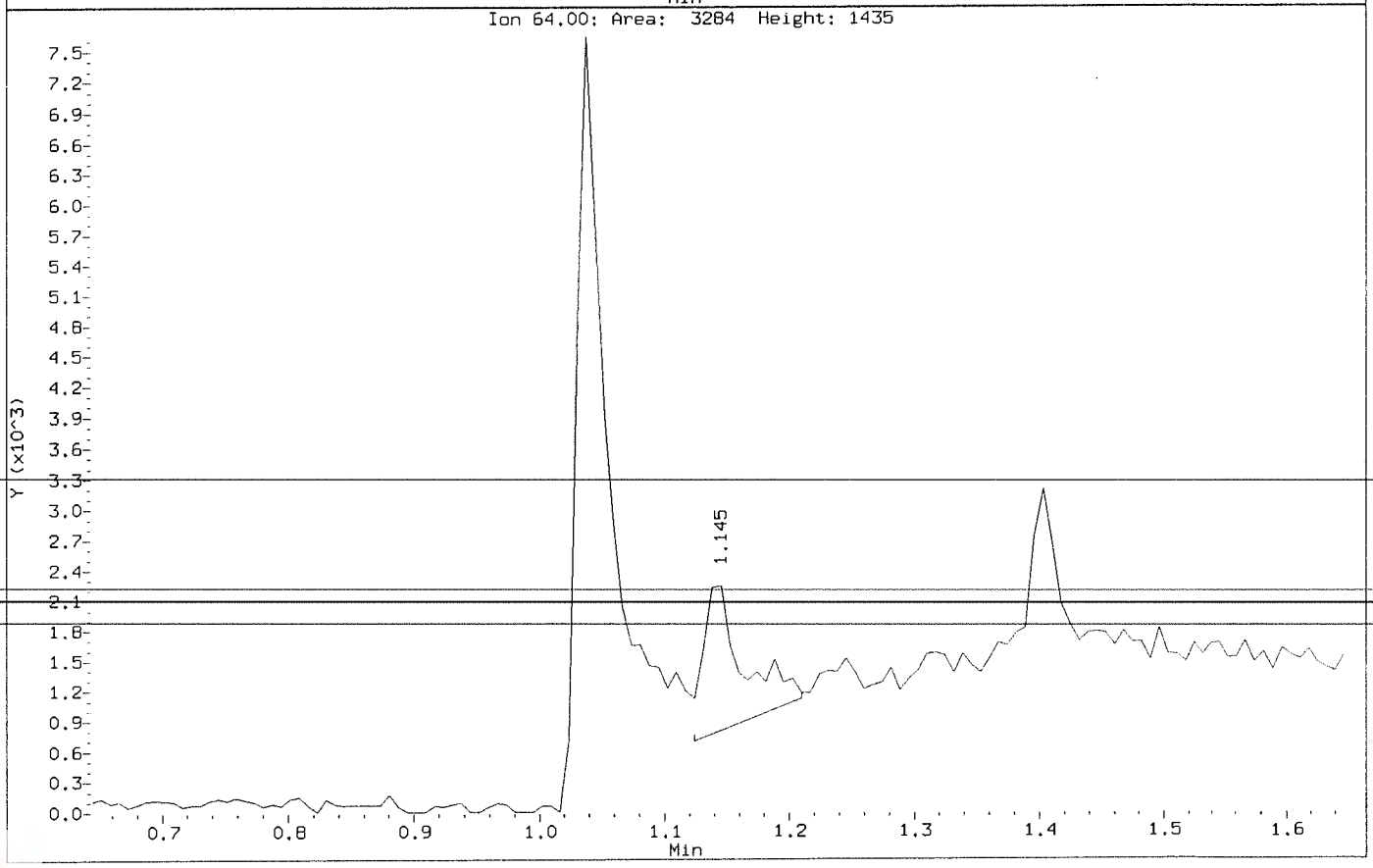




Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\BEFORE2\X092403.D
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

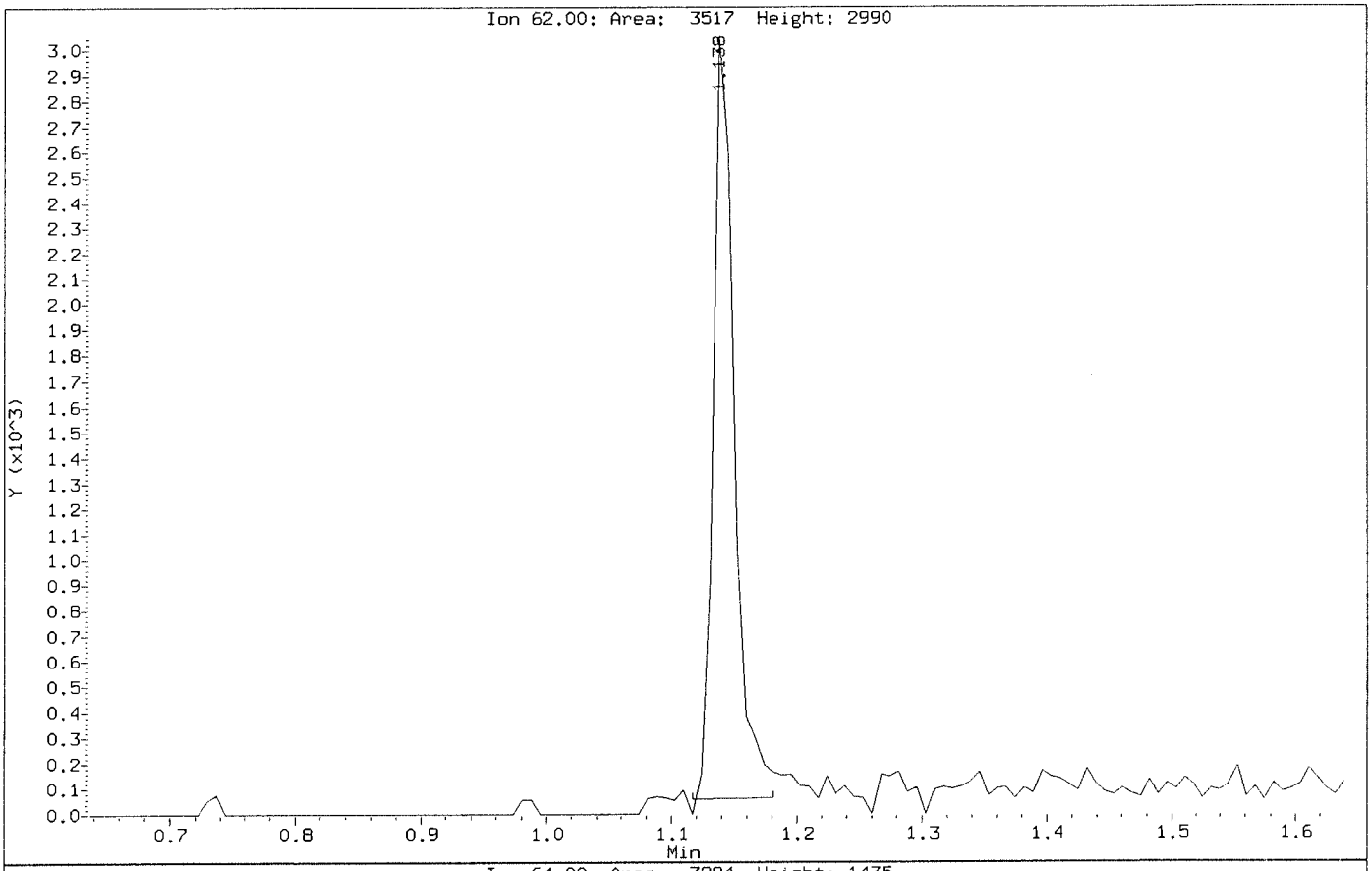
Compound: Vinyl Chloride
CAS Number: 75-01-4

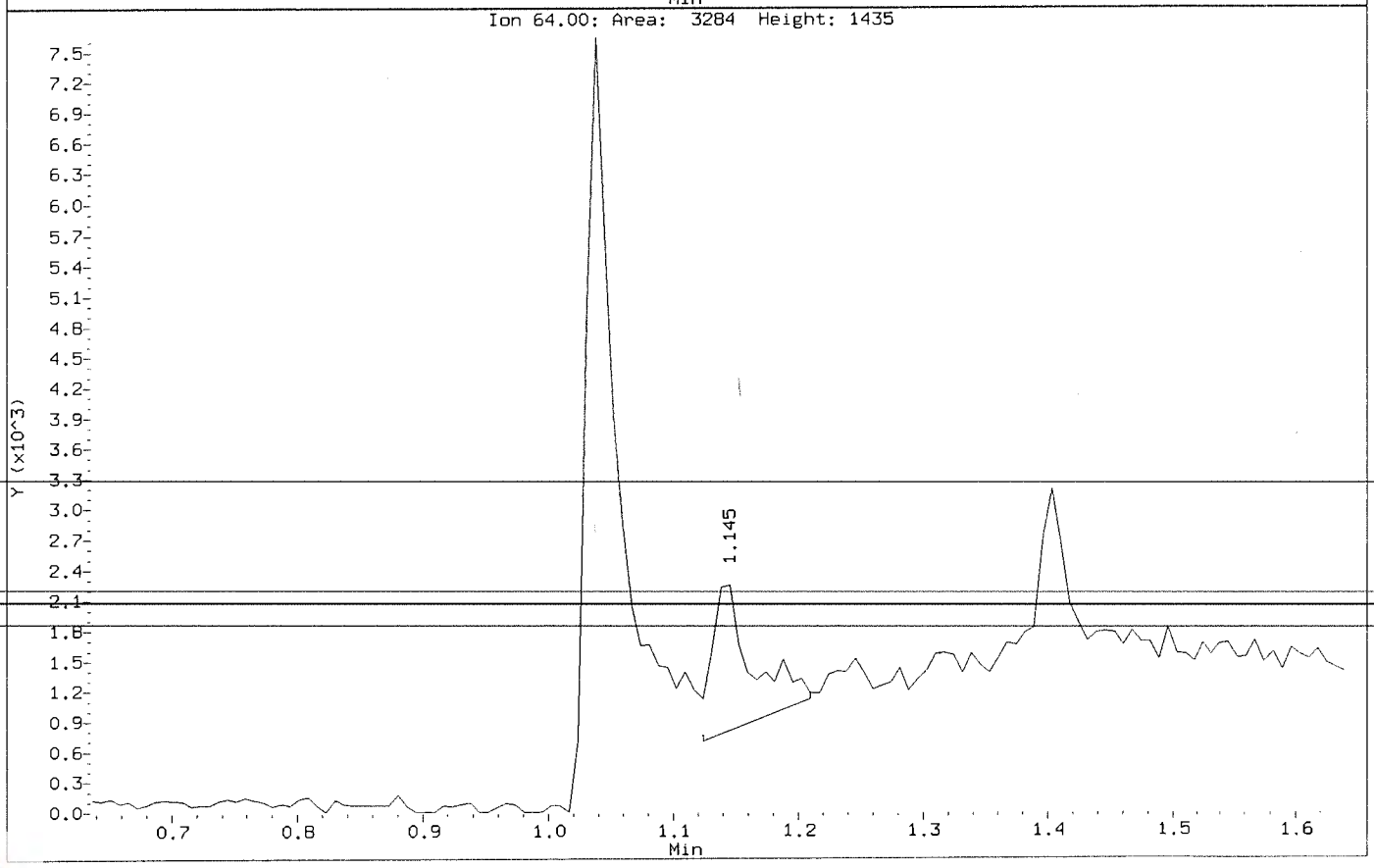




Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092403.D
Injection Date: 24-SEP-2019 11:36
Instrument: voa6.i
Client Sample ID: VSTD000.5

Compound: Vinyl Chloride
CAS Number: 75-01-4





Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092404.D Page 1
Report Date: 09-Oct-2019 18:32

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092404.D
Lab Smp Id: VSTD001 Client Smp ID: VSTD001
Inj Date : 24-SEP-2019 12:23
Operator : PC Inst ID: voa6.i
Smp Info : VSTD001;VSTD001;1;3;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 12:23 Cal File: X092404.D
Als bottle: 5 Calibration Sample, Level: 3
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

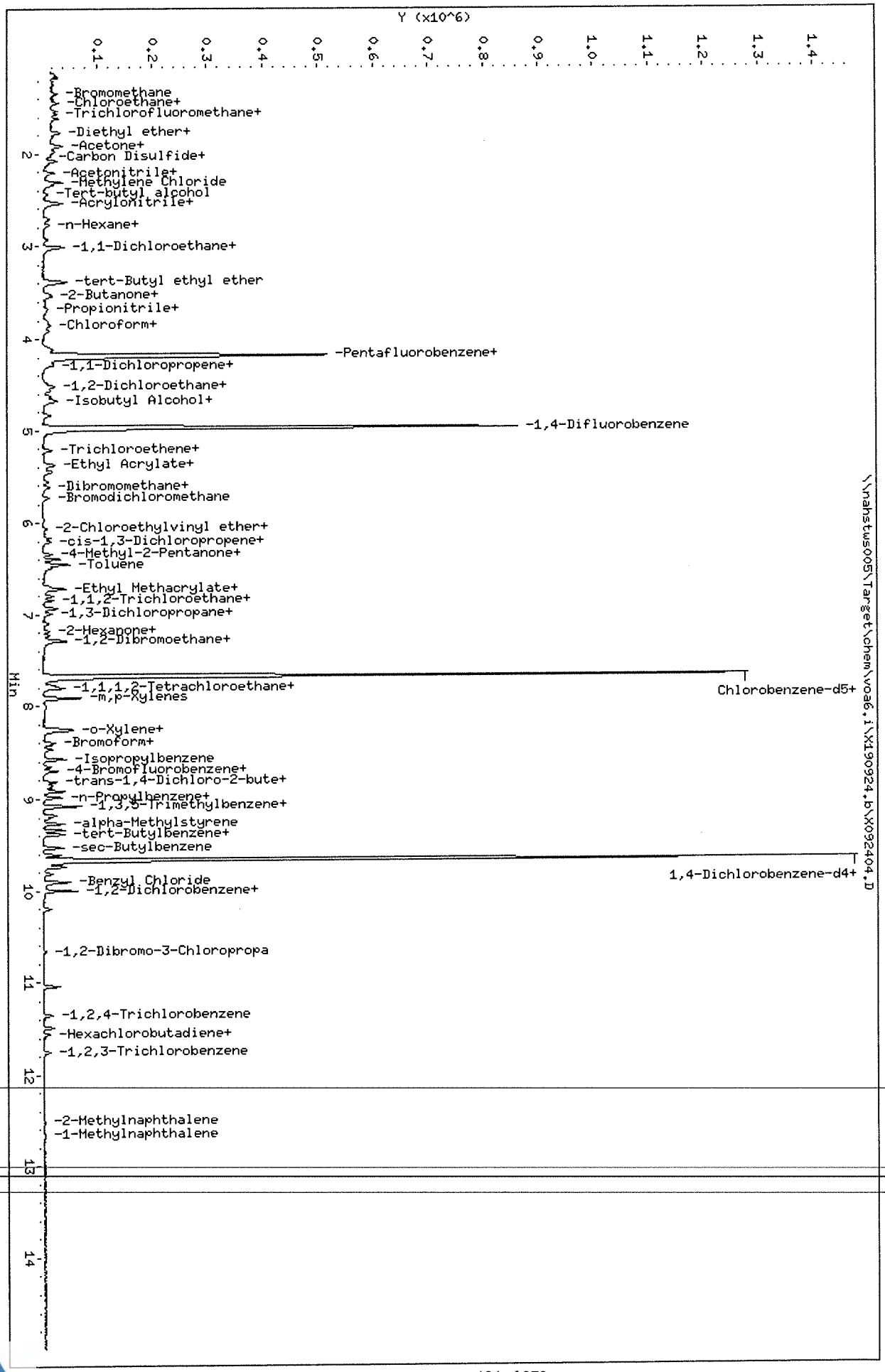
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	4547	1.00000	0.26(a)
11 1,1-Dichloroethene	96	1.919	1.911	(0.458)	3910	1.00000	0.99(a)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	6568	1.00000	0.98(a)
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.844)	6052	1.00000	1.08(a)
17 Methylene Chloride	84	2.305	2.305	(0.550)	9629	1.00000	0.33(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	5524	1.00000	1.00(a)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	5660	1.00000	0.98(a)
$ 35 1,2-Dichloroethane-d4	65	4.483	4.476	(1.070)	6313	1.00000	0.27(a)
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	8451	1.00000	0.23(a)
$ 30 Dibromofluoromethane	113	4.110	4.103	(0.981)	4969	1.00000	0.28(a)
$ 48 Toluene-d8	98	6.395	6.388	(0.834)	19808	1.00000	1.11(a)
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	452353	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	713817	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	634278	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	332471	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092404.D
Date : 24-SEP-2019 12:23
Client ID: VSTD001
Sample Info: VSTD001;VSTD001;1;3;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092405.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092405.D
Lab Smp Id: VSTD002 Client Smp ID: VSTD002
Inj Date : 24-SEP-2019 12:47
Operator : PC Inst ID: voa6.i
Smp Info : VSTD002;VSTD002;1;4;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 12:47 Cal File: X092405.D
Als bottle: 6 Calibration Sample, Level: 4
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

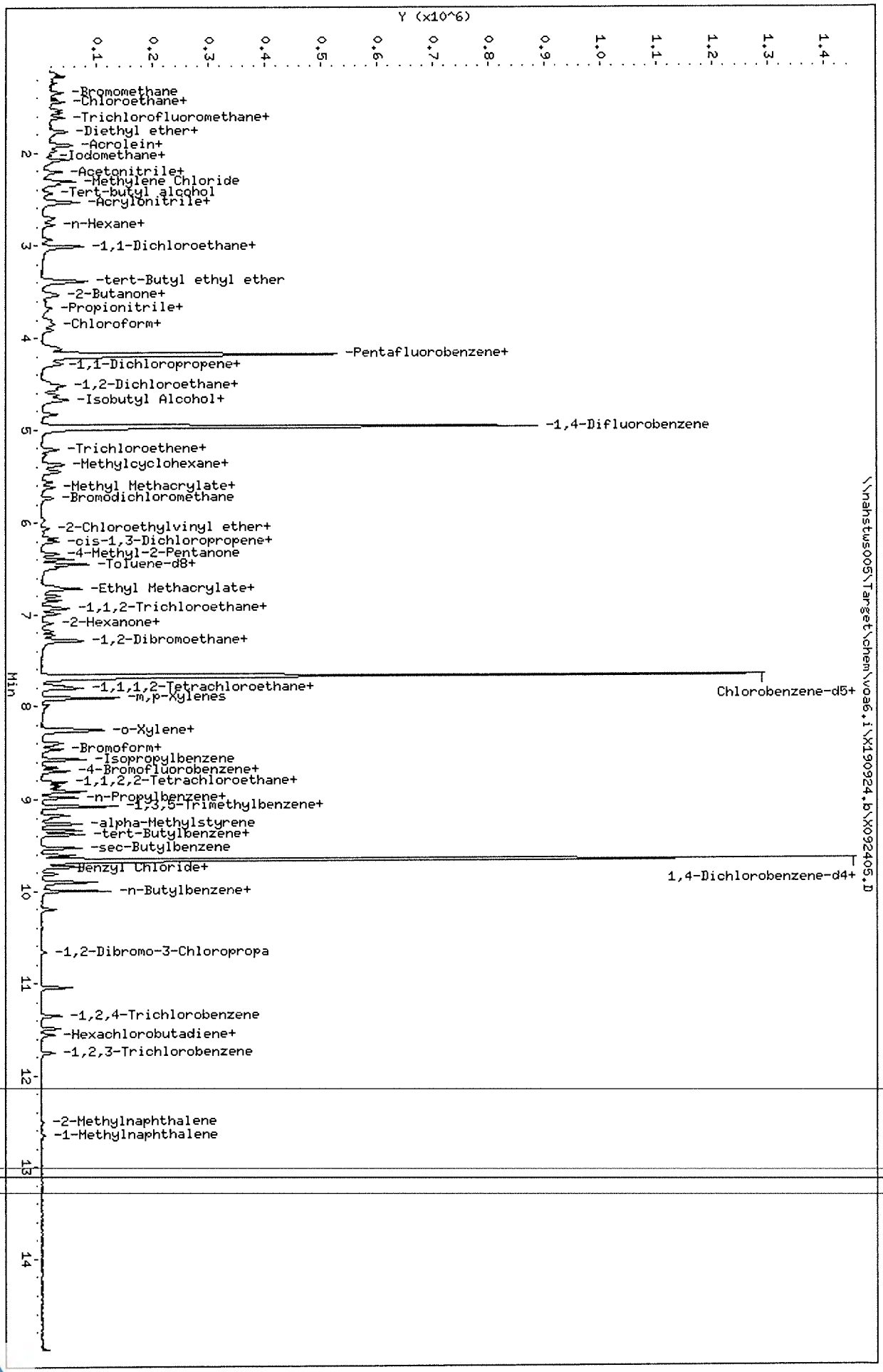
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	7961	2.00000	1.18(a)
11 1,1-Dichloroethene	96	1.912	1.911	(0.456)	7818	2.00000	1.97(a)
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	14205	2.00000	2.11(a)
27 cis-1,2-Dichloroethene	96	3.538	3.530	(0.844)	11063	2.00000	1.95(a)
17 Methylene Chloride	84	2.305	2.305	(0.550)	14182	2.00000	1.25(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	10851	2.00000	1.96(a)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	11471	2.00000	1.97(a)
$ 35 1,2-Dichloroethane-d4	65	4.483	4.476	(1.070)	11919	2.00000	1.35(a)
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	14730	2.00000	1.25(a)
$ 30 Dibromofluoromethane	113	4.111	4.103	(0.981)	8916	2.00000	1.17(a)
$ 48 Toluene-d8	98	6.396	6.388	(0.834)	36351	2.00000	2.00(a)
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	458186	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	722014	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	645290	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	337724	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092405.D
Date : 24-SEP-2019 12:47
Client ID: VSTD002
Sample Info: VSTD002;VSTD002;1;4;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092406.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092406.D
Lab Smp Id: VSTD005 Client Smp ID: VSTD005
Inj Date : 24-SEP-2019 13:11
Operator : PC Inst ID: voa6.i
Smp Info : VSTD005;VSTD005;1;5;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 13:11 Cal File: X092406.D
Als bottle: 7 Calibration Sample, Level: 5
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

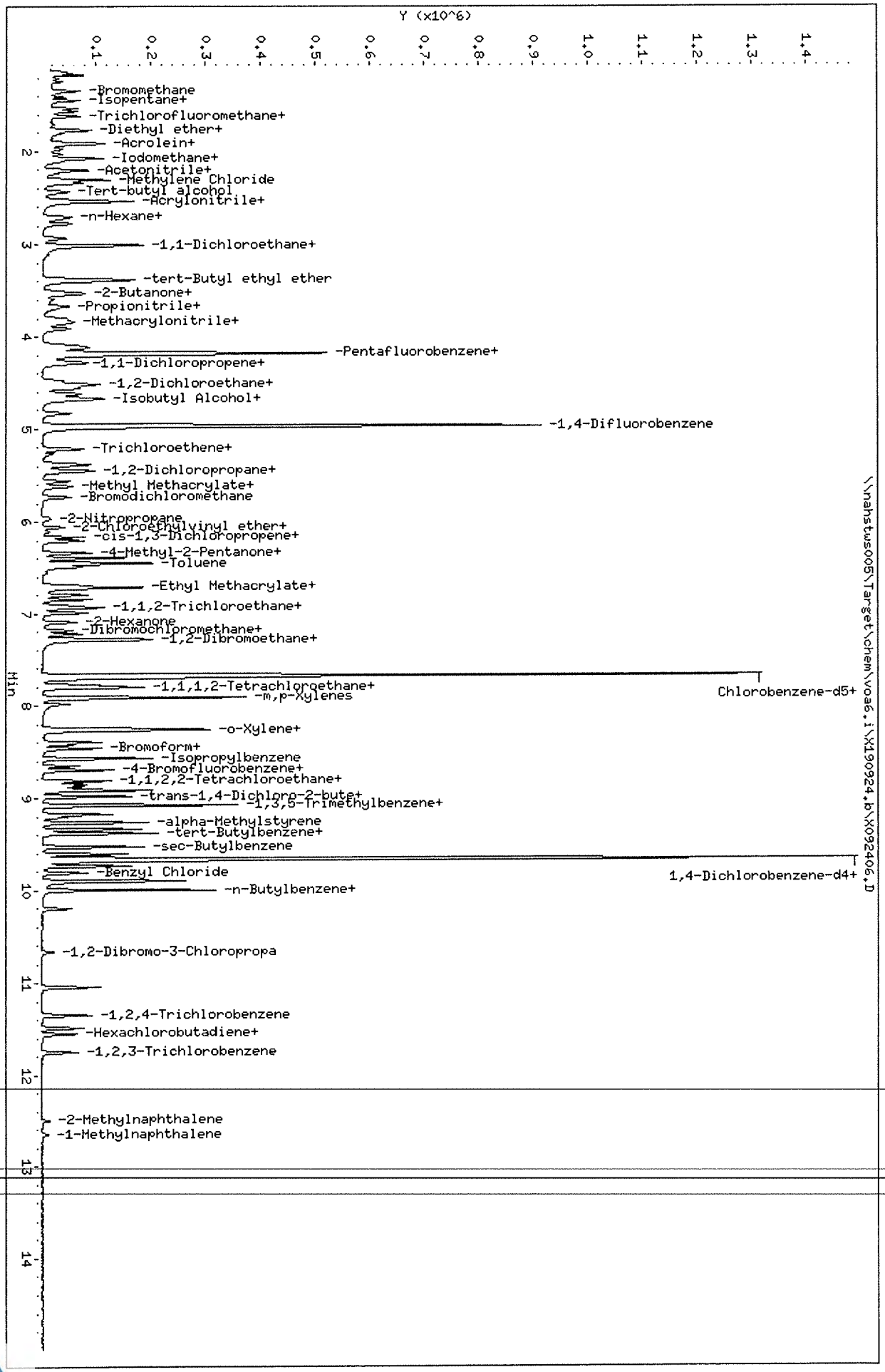
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	21561	5.00000	4.97(a)
11 1,1-Dichloroethene	96	1.919	1.911	(0.458)	18685	5.00000	4.87(a)
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	33666	5.00000	5.05
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.844)	28266	5.00000	5.17
17 Methylene Chloride	84	2.305	2.305	(0.550)	29957	5.00000	4.78(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	26842	5.00000	4.90(a)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	26531	5.00000	4.73(a)
$ 35 1,2-Dichloroethane-d4	65	4.483	4.476	(1.070)	28682	5.00000	4.82(a)
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	35795	5.00000	4.79(a)
$ 30 Dibromofluoromethane	113	4.110	4.103	(0.981)	25838	5.00000	5.22
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	94779	5.00000	5.26
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	442787	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	714623	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	640341	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	335748	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092406.D
Date : 24-SEP-2019 13:11
Client ID: VSTD005
Sample Info: VSTD005;VSTD005;1;5;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092407.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092407.D
Lab Smp Id: VSTD020 Client Smp ID: VSTD020
Inj Date : 24-SEP-2019 13:35
Operator : PC Inst ID: voa6.i
Smp Info : VSTD020;VSTD020;1;6;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 13:35 Cal File: X092407.D
Als bottle: 8 Calibration Sample, Level: 6
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

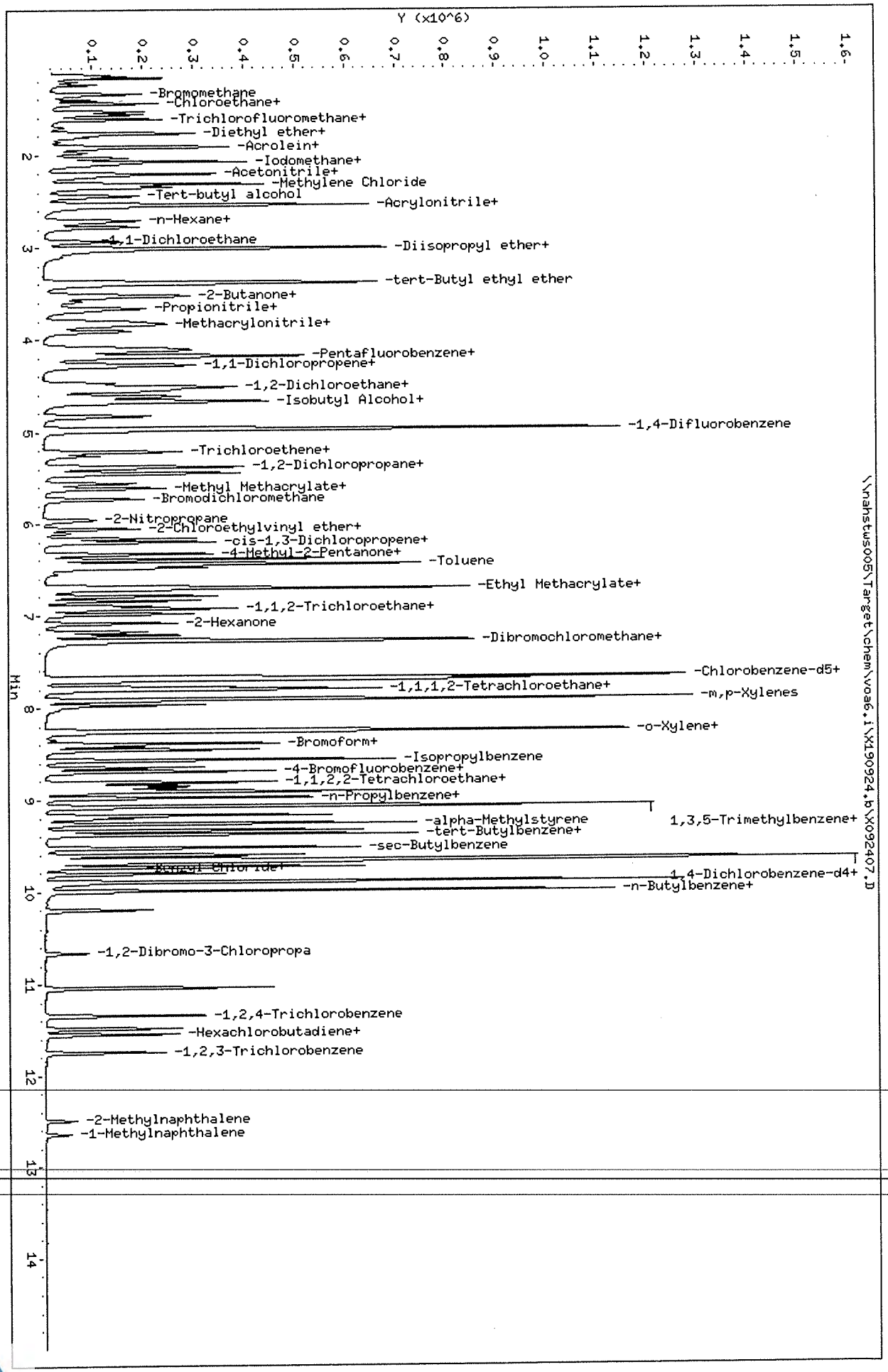
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	72743	20.0000	20.14
11 1,1-Dichloroethene	96	1.911	1.911	(0.456)	67984	20.0000	17.89
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	120625	20.0000	19.09
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	100416	20.0000	18.53
17 Methylene Chloride	84	2.305	2.305	(0.550)	97780	20.0000	19.67
38 Trichloroethene	130	5.214	5.214	(1.049)	94083	20.0000	18.08
5 Vinyl Chloride	62	1.138	1.138	(0.272)	98170	20.0000	17.67
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	103005	20.0000	20.06
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	123917	20.0000	20.55
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	89138	20.0000	20.30
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	329347	20.0000	19.17
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	438777	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	678616	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.678	(1.000)	611359	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	317541	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092407.D
Date : 24-SEP-2019 13:35
Client ID: VSTD020
Sample Info: VSTD020;VSTD020;1;6;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092408.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092408.D
Lab Smp Id: VSTD050 Client Smp ID: VSTD050
Inj Date : 24-SEP-2019 13:59
Operator : PC Inst ID: voa6.i
Smp Info : VSTD050;VSTD050;1;7;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 9 Calibration Sample, Level: 7
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

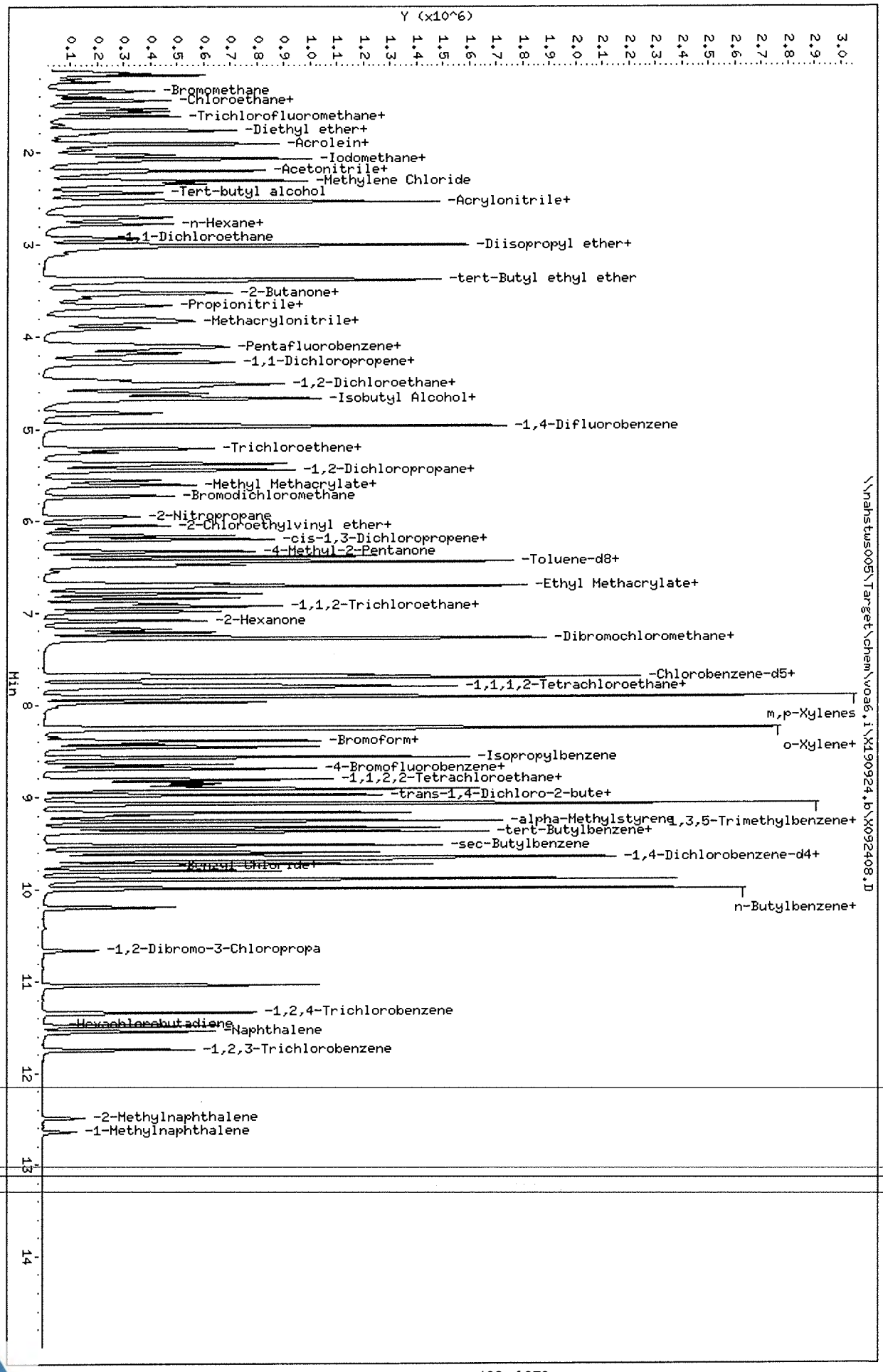
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	171839	50.0000	50.94
11 1,1-Dichloroethene	96	1.911	1.911	(0.457)	166738	50.0000	45.11
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	276983	50.0000	45.41
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	238099	50.0000	45.18
17 Methylene Chloride	84	2.305	2.305	(0.551)	225405	50.0000	48.96
38 Trichloroethene	130	5.214	5.214	(1.049)	221246	50.0000	44.06
5 Vinyl Chloride	62	1.138	1.138	(0.272)	245125	50.0000	45.37
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	234244	50.0000	48.22
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	282942	50.0000	50.43
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	199887	50.0000	47.93
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	733236	50.0000	44.37
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	426802	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	654978	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	588056	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	304949	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092408.D
Date : 24-SEP-2019 13:59
Client ID: VSTD050
Sample Info: VSTD050;VSTD050;1;7;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092409.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092409.D
Lab Smp Id: VSTD100 Client Smp ID: VSTD100
Inj Date : 24-SEP-2019 14:23
Operator : PC Inst ID: voa6.i
Smp Info : VSTD100;VSTD100;1;8;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 14:23 Cal File: X092409.D
Als bottle: 10 Calibration Sample, Level: 8
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

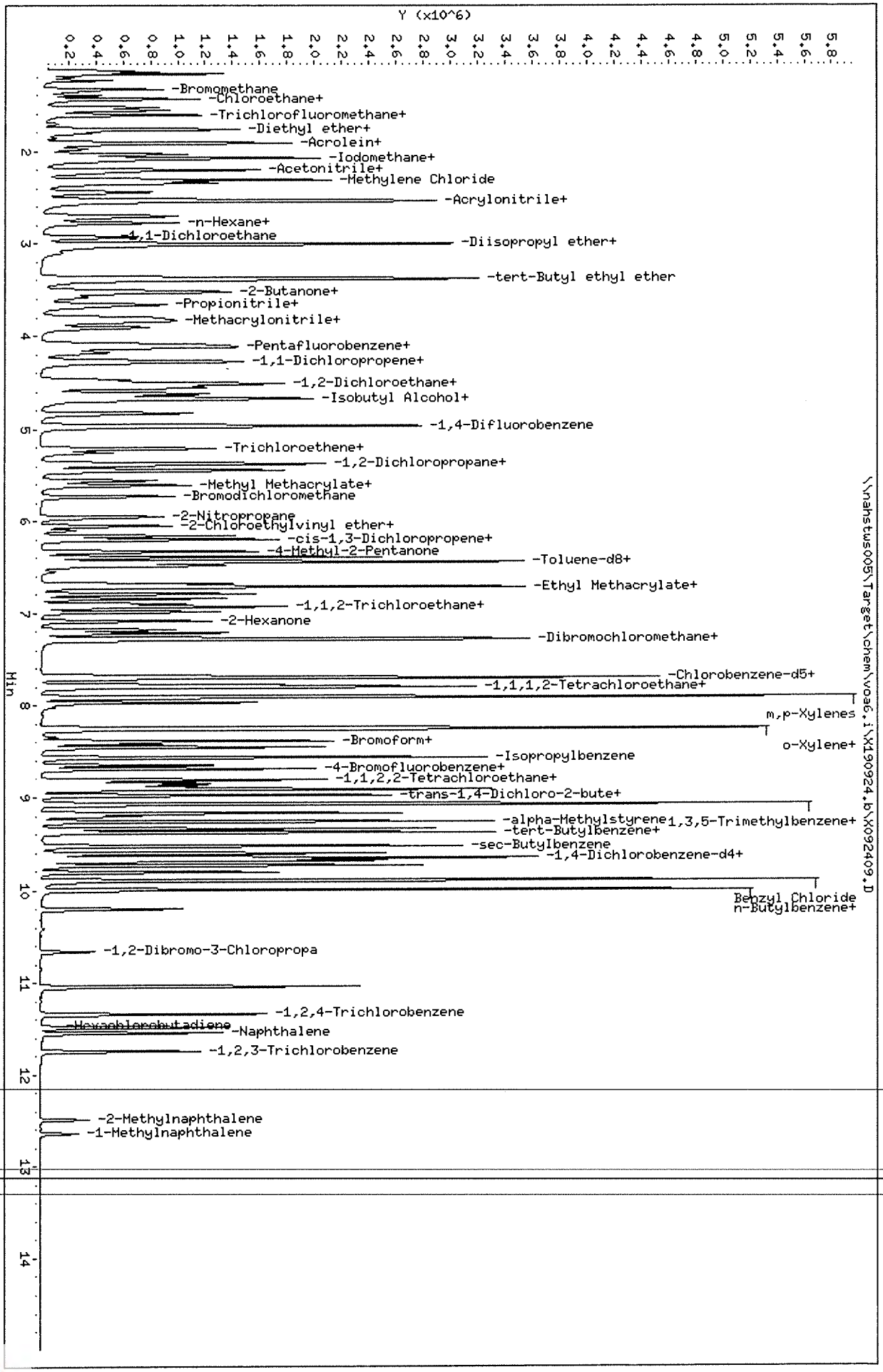
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	329695	100.000	102.75
11 1,1-Dichloroethene	96	1.912	1.911	(0.457)	343210	100.000	102.44
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	547609	100.000	96.93
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	462898	100.000	96.91
17 Methylene Chloride	84	2.306	2.305	(0.551)	435117	100.000	106.20
38 Trichloroethene	130	5.214	5.214	(1.049)	450504	100.000	96.87
5 Vinyl Chloride	62	1.138	1.138	(0.272)	516628	100.000	105.48
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	463426	100.000	106.39
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	545858	100.000	102.48
$ 30 Dibromofluoromethane	113	4.104	4.103	(0.981)	396845	100.000	106.00
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	1483903	100.000	93.48
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	386906	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	606689	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	564926	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	281162	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092409.D
Date : 24-SEP-2019 14:23
Client ID: VSTD100
Sample Info: VSTD100;VSTD100;1;8;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092410.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092410.D
Lab Smp Id: VSTD150 Client Smp ID: VSTD150
Inj Date : 24-SEP-2019 14:47
Operator : PC Inst ID: voa6.i
Smp Info : VSTD150;VSTD150;1;9;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 14:47 Cal File: X092410.D
Als bottle: 11 Calibration Sample, Level: 9
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

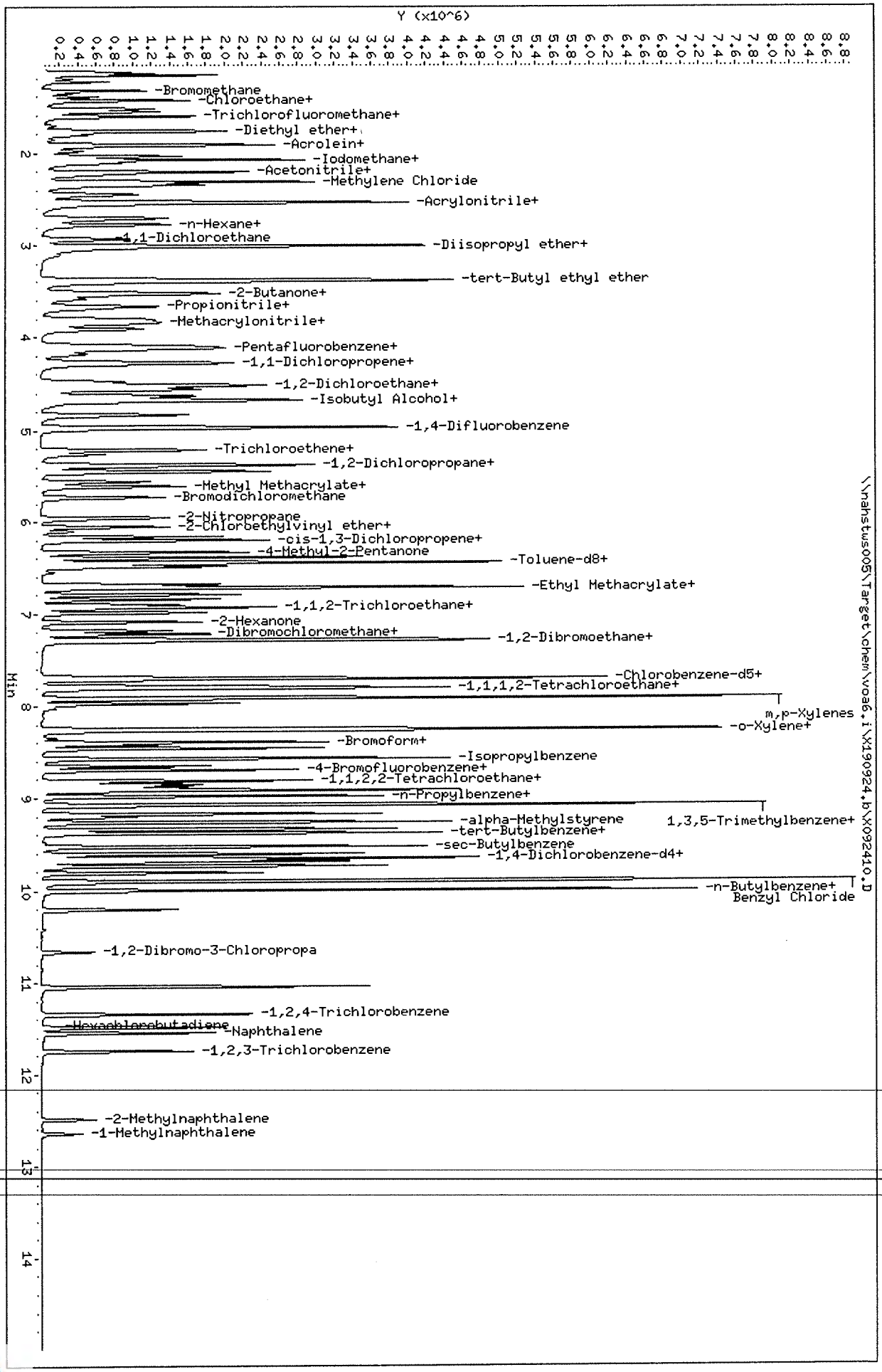
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.892)	458033	150.000	150.64
11 1,1-Dichloroethene	96	1.911	1.911	(0.456)	481682	150.000	146.81
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	759060	150.000	141.64
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	653149	150.000	139.63
17 Methylene Chloride	84	2.305	2.305	(0.550)	608299	150.000	152.34
38 Trichloroethene	130	5.214	5.214	(1.049)	640511	150.000	145.18
5 Vinyl Chloride	62	1.138	1.138	(0.272)	733937	150.000	153.02
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	649926	150.000	152.79
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.132)	769184	150.000	152.51
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	558432	150.000	152.69
$ 48 Toluene-d8	98	6.388	6.388	(0.832)	2074299	150.000	137.48
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	378896	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	575537	50.0000	
* 47 Chlorobenzene-d5	117	7.678	7.678	(1.000)	536954	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	270032	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092410.D
Date : 24-SEP-2019 14:47
Client ID: VSTD150
Sample Info: VSTD150;VSTD150;1;9;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092411.D
Lab Smp Id: VSTD200 Client Smp ID: VSTD200
Inj Date : 24-SEP-2019 15:11
Operator : PC Inst ID: voa6.i
Smp Info : VSTD200;VSTD200;1;10;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 15:11 Cal File: X092411.D
Als bottle: 12 Calibration Sample, Level: 10
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

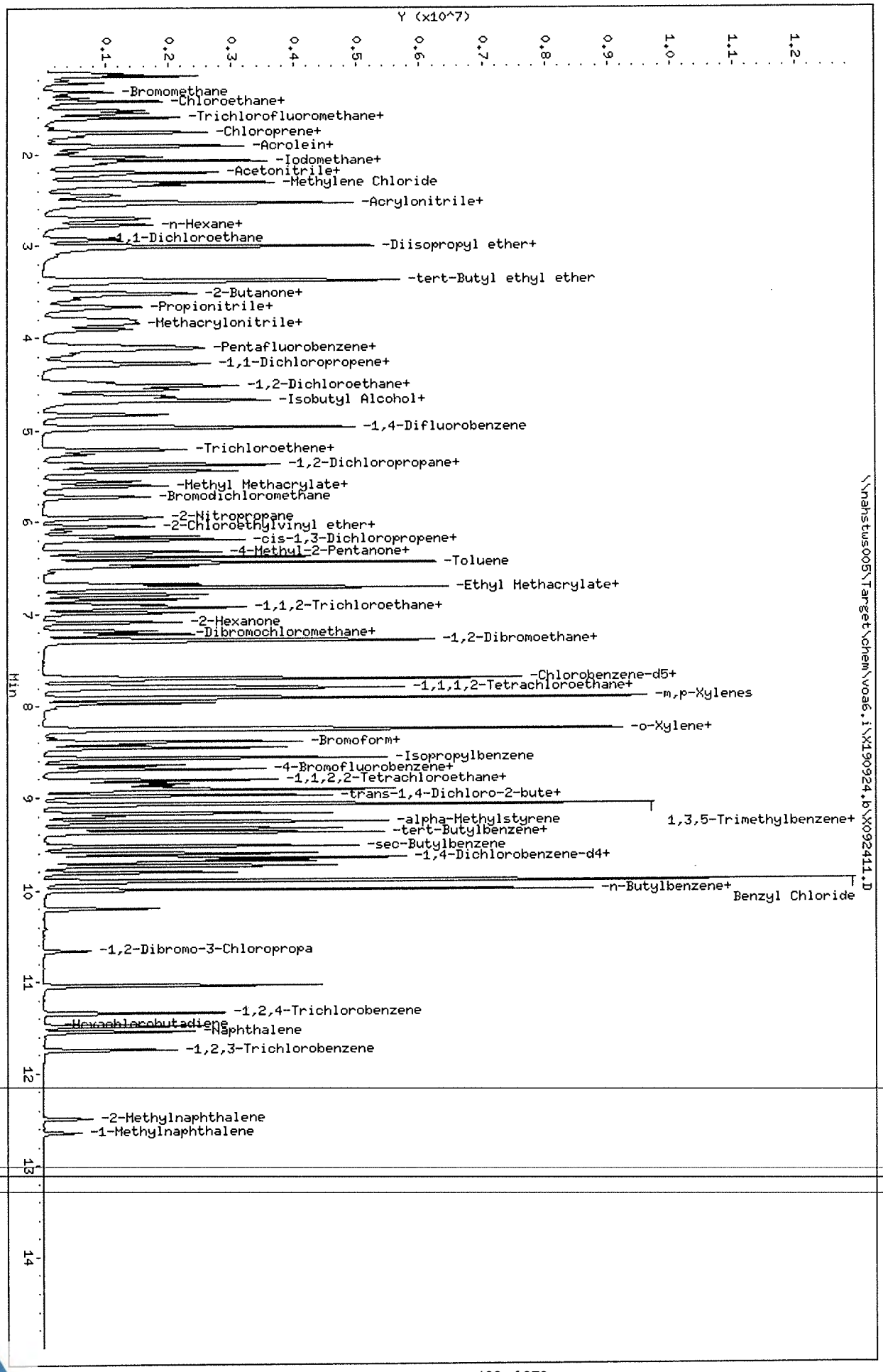
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.892)	587385	200.000	197.82
11 1,1-Dichloroethene	96	1.911	1.911	(0.456)	610818	200.000	188.64
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	966214	200.000	187.44
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	832429	200.000	180.32
17 Methylene Chloride	84	2.305	2.305	(0.550)	766926	200.000	195.09
38 Trichloroethene	130	5.214	5.214	(1.049)	808345	200.000	190.48
5 Vinyl Chloride	62	1.138	1.138	(0.272)	947002	200.000	200.07(A)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	816407	200.000	194.75
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.132)	968135	200.000	196.59
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	703317	200.000	195.10
$ 48 Toluene-d8	98	6.388	6.388	(0.832)	2619468	200.000	177.49
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	373921	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	553609	50.0000	
* 47 Chlorobenzene-d5	117	7.678	7.678	(1.000)	525222	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	260171	50.0000	

QC Flag Legend

A - Target compound detected but, quantitated amount exceeded maximum amount.

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092411.D
Date : 24-SEP-2019 15:11
Client ID: VSTD200
Sample Info: VSTD200;VSTD200;1;10;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092414.D Page 1
Report Date: 09-Oct-2019 18:33

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092414.D
Lab Smp Id: ICV Client Smp ID: ICV
Inj Date : 24-SEP-2019 16:23
Operator : PC Inst ID: voa6.i
Smp Info : CCV;CCV;2;;ICV
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:26 voa6.i Quant Type: ISTD
Cal Date : 24-SEP-2019 12:23 Cal File: X092404.D
Als bottle: 15 QC Sample: METHSPIKE
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

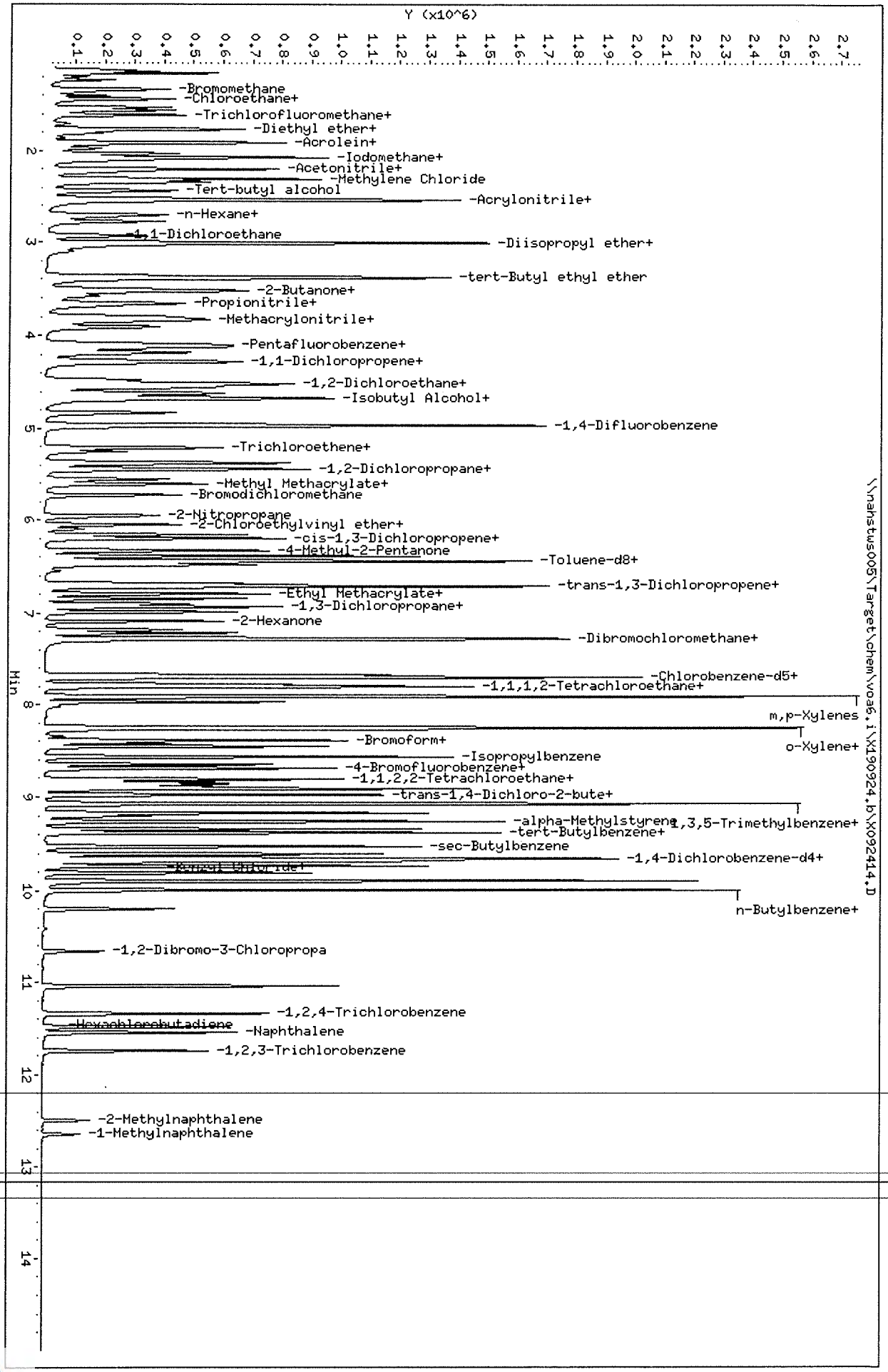
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	163018	50.9184	50.91
11 1,1-Dichloroethene	96	1.912	1.911	(0.456)	156238	44.6179	44.61
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	266861	46.7548	46.75
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	226474	45.3645	45.36
17 Methylene Chloride	84	2.306	2.305	(0.550)	216855	49.7456	49.74
38 Trichloroethene	130	5.214	5.214	(1.049)	208914	44.4618	44.46
5 Vinyl Chloride	62	1.138	1.138	(0.272)	231875	45.2972	45.29
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	232871	50.6437	50.64
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	278585	52.3606	52.36
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	201029	50.9341	50.93
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	746125	47.5753	47.57
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	404392	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	612991	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	558138	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	293307	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092414.D
Date : 24-SEP-2019 16:23
Client ID: ICV
Sample Info: CCV;CCV;2;;ICV
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092417.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092417.D
Lab Smp Id: VLCSW-190924 Client Smp ID: VLCSW-190924
Inj Date : 24-SEP-2019 17:35
Operator : PC Inst ID: voa6.i
Smp Info : VLCSW-190924;VLCSW-190924;3;;LCS
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 18 QC Sample: LCS
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

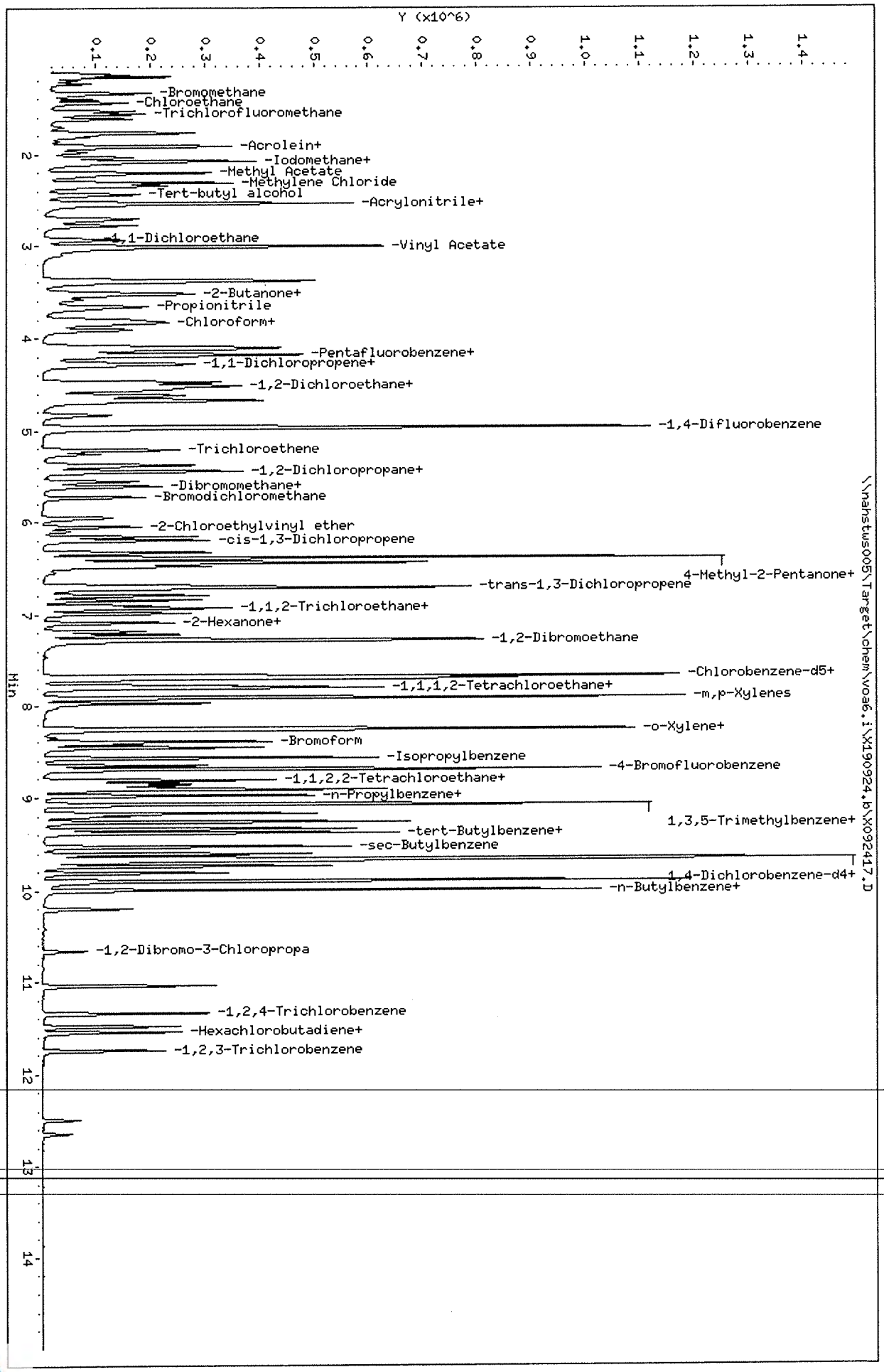
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	68942	20.4508	20.45
11 1,1-Dichloroethene	96	1.919	1.911	(0.458)	65908	18.8788	18.87
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	114935	19.5542	19.55
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	95821	19.2518	19.25
17 Methylene Chloride	84	2.306	2.305	(0.550)	92643	20.3386	20.33
38 Trichloroethene	130	5.214	5.214	(1.049)	87919	18.1698	18.16
5 Vinyl Chloride	62	1.138	1.138	(0.272)	94001	18.4189	18.41
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	238522	52.0566	52.05
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	286700	52.6651	52.66
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	204828	52.0726	52.07
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	742552	46.2689	46.26
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	403171	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	631257	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	571149	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	300403	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092417.D
Date : 24-SEP-2019 17:35
Client ID: VLCSW-190924
Sample Info: VLCSW-190924;VLCSW-190924;3;;LCS
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092419.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092419.D
Lab Smp Id: VBLKW-190924 Client Smp ID: VBLKW-190924
Inj Date : 24-SEP-2019 18:23
Operator : PC Inst ID: voa6.i
Smp Info : VBLKW-190924;VBLKW-190924;3;;BLANK
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 20 QC Sample: BLANK
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

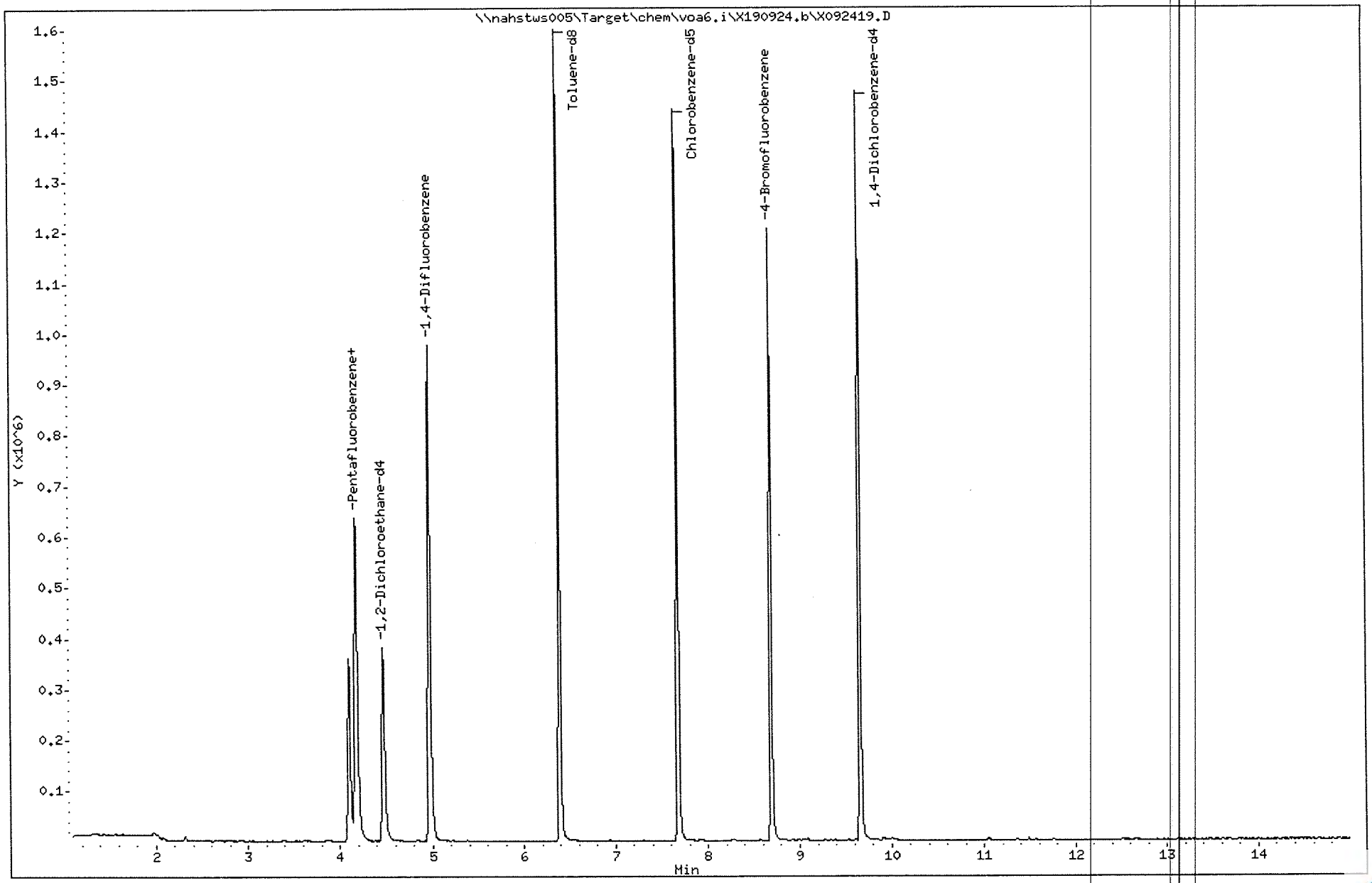
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	284109	45.5256	45.52
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	346953	52.2917	52.29
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	252204	47.1203	47.12
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	955959	48.8807	48.88
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	547665	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	807277	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	696007	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	355530	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092419.D
Date : 24-SEP-2019 18:23
Client ID: VBLKW-190924
Sample Info: VBLKW-190924;VBLKW-190924;3;;BLANK
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092420.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092420.D
Lab Smp Id: HS19090860-01 Client Smp ID: HS19090860-01
Inj Date : 24-SEP-2019 18:47
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-01;HS19090860-01;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 21
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

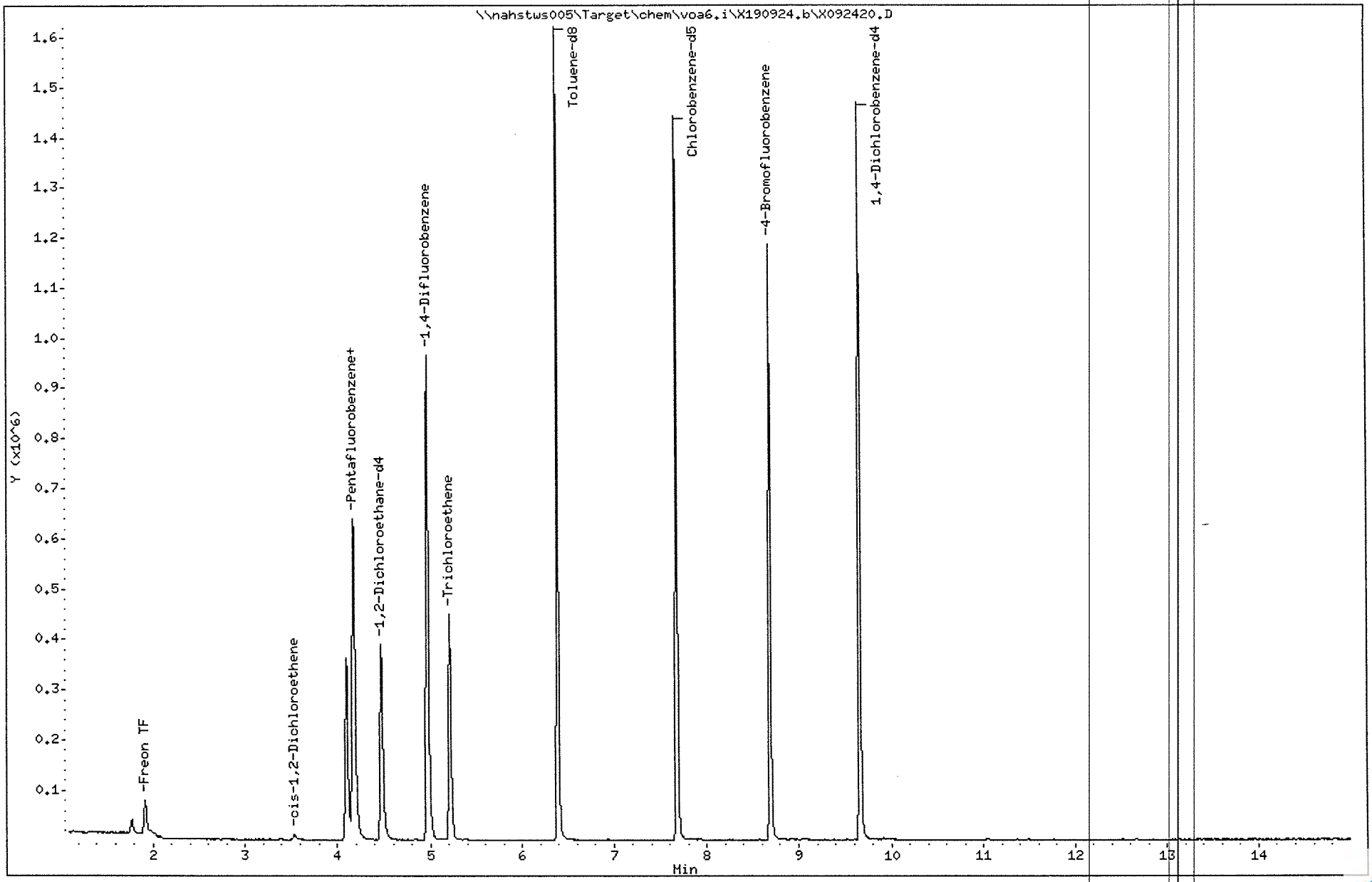
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.846)	5354	0.78924	0.78(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	156710	25.2611	25.26
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	285497	45.5967	45.59
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	345717	51.5646	51.56
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	253441	47.1945	47.19
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	964764	48.8343	48.83
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	549501	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	809316	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	703085	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	361280	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092420.D
Date : 24-SEP-2019 18:47
Client ID: HS19090860-01
Sample Info: HS19090860-01;HS19090860-01;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092420.D

Date : 24-SEP-2019 18:47

Client ID: HS19090860-01

Instrument: voa6.i

Sample Info: HS19090860-01;HS19090860-01;;;

Purge Volume: 5.0

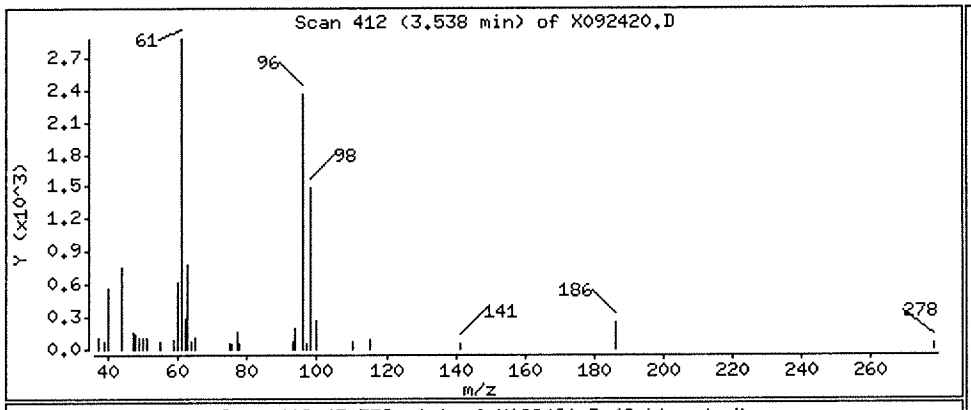
Operator: PC

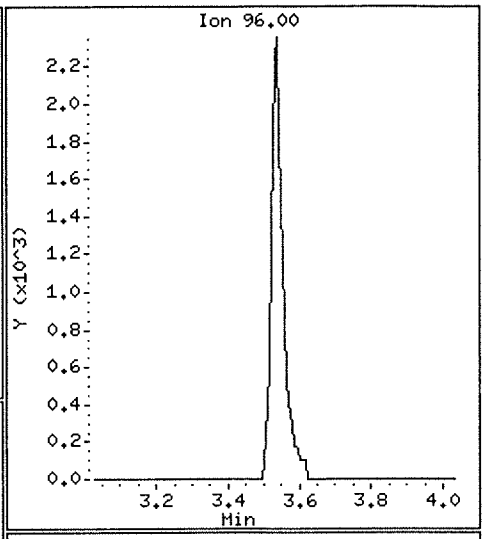
Column phase: DB624

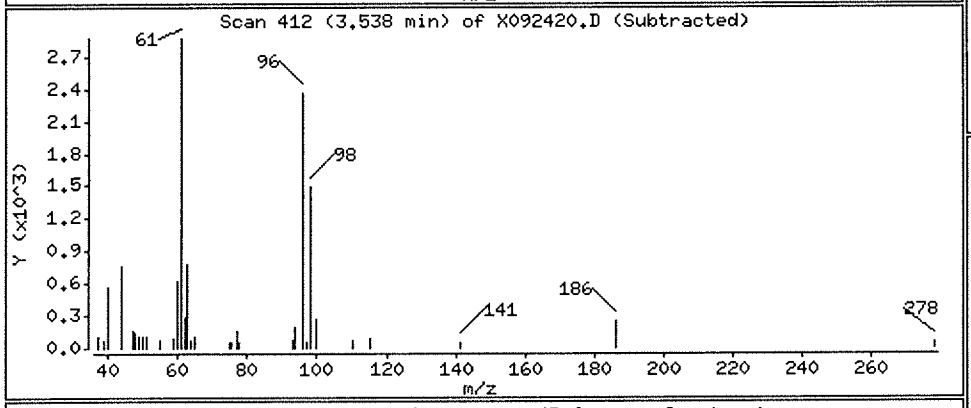
Column diameter: 0.18

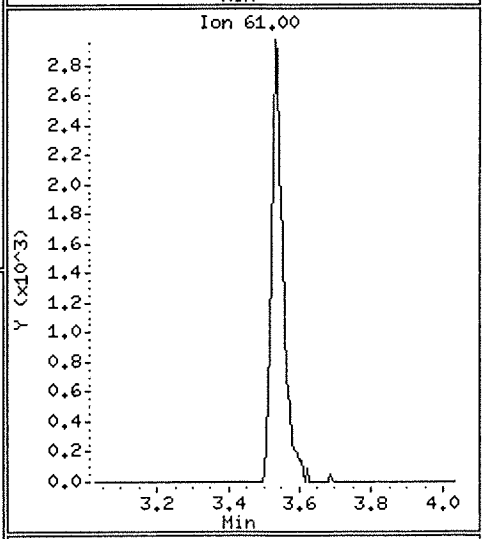
27 cis-1,2-Dichloroethene

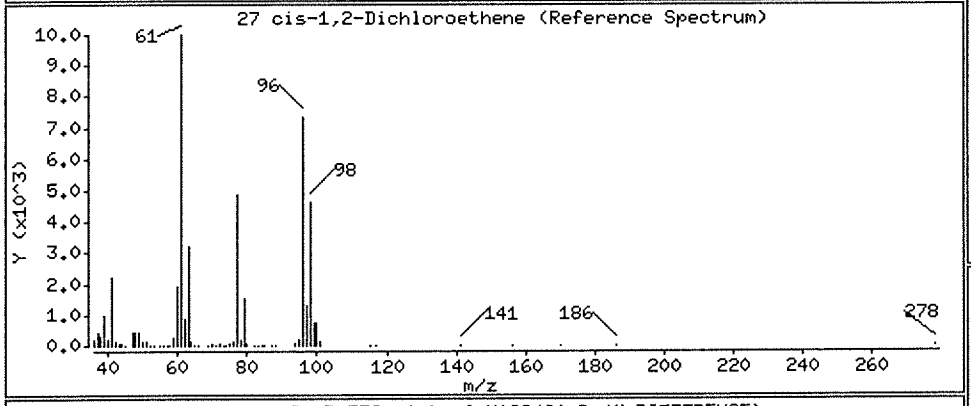
Concentration: 0.78 ug/l

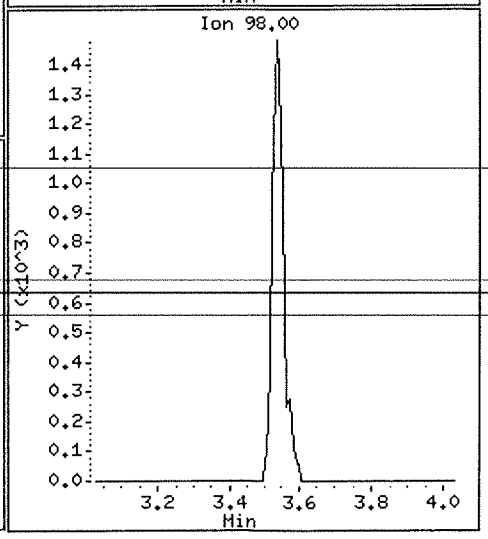


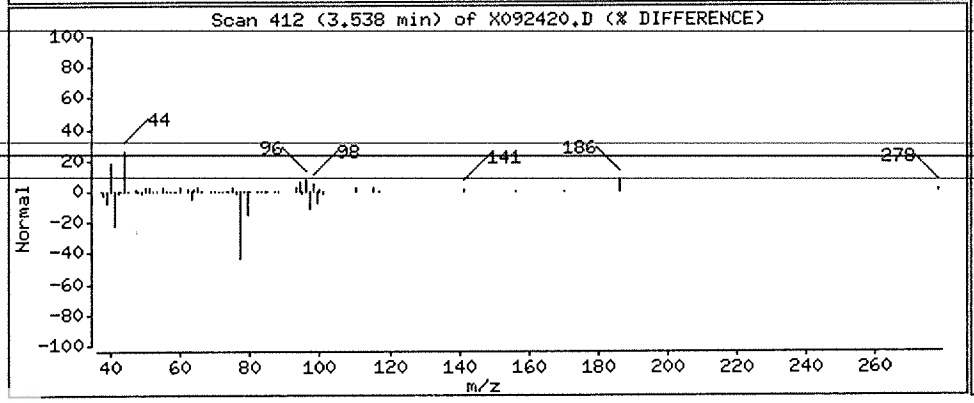












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092420.D

Date : 24-SEP-2019 18:47

Client ID: HS19090860-01

Instrument: voa6.i

Sample Info: HS19090860-01;HS19090860-01;;;

Purge Volume: 5.0

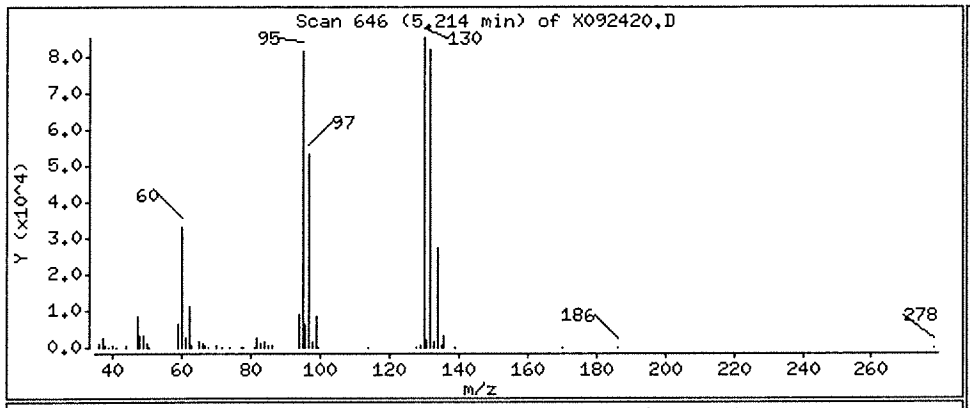
Operator: PC

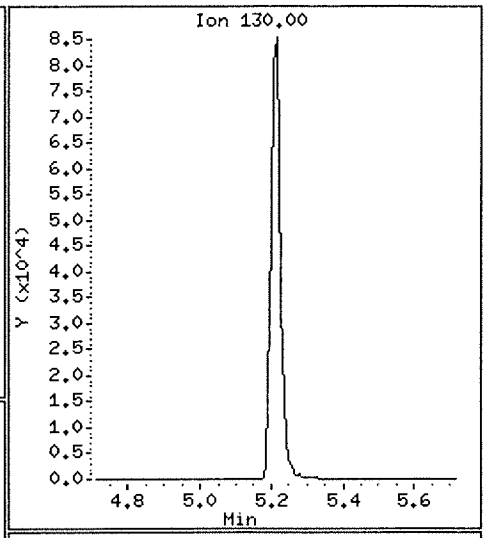
Column phase: DB624

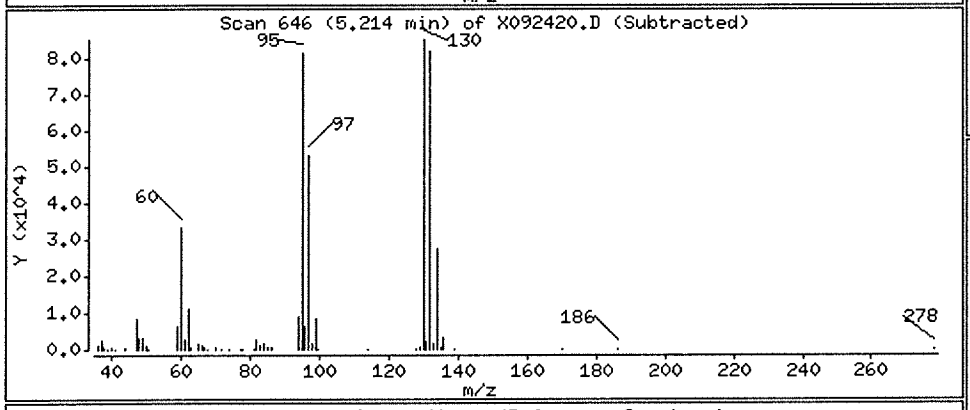
Column diameter: 0.18

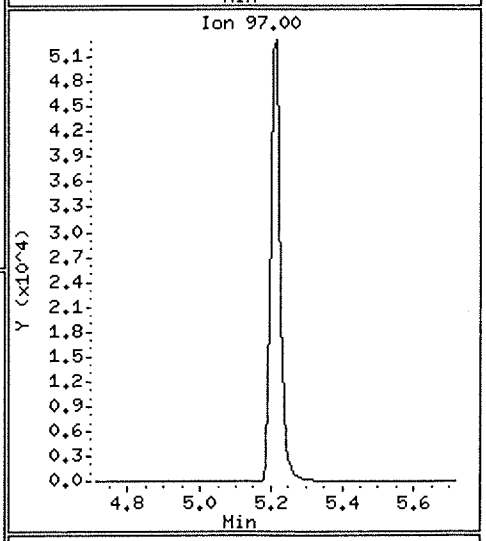
38 Trichloroethene

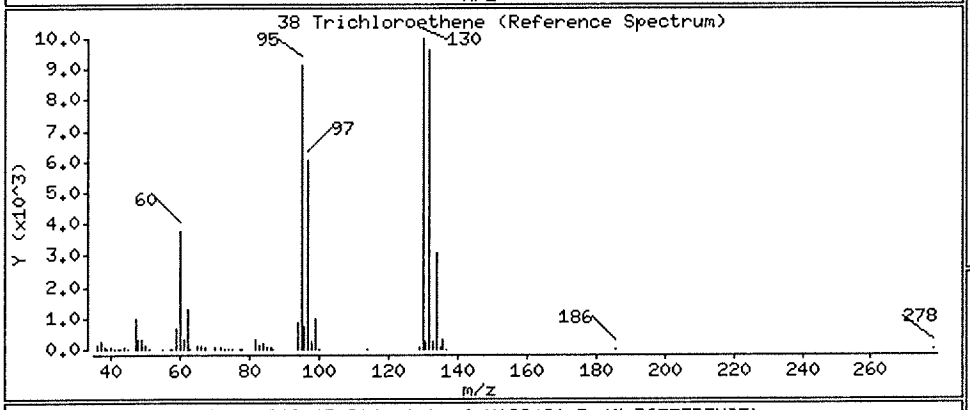
Concentration: 25.26 ug/l

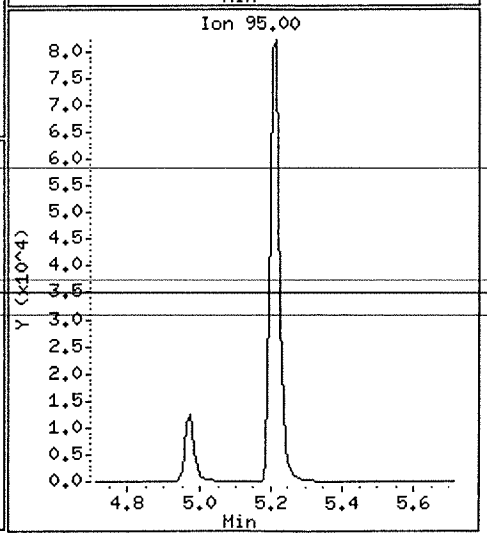


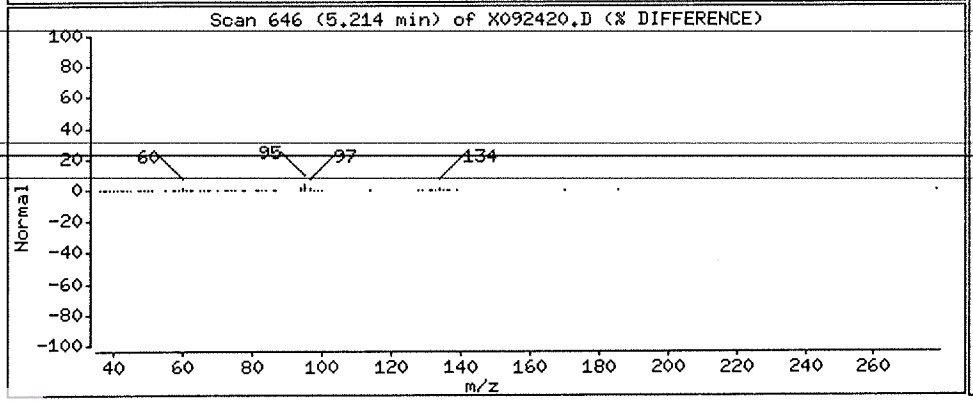












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D
Lab Smp Id: HS19090860-02 Client Smp ID: HS19090860-02
Inj Date : 24-SEP-2019 19:11
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-02;HS19090860-02;;;
Misc Info : HS18090001;WATER;0;25;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 22
Dil Factor: 25.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	25.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.919	1.911	(0.459)	4687	0.99681	24.92(a)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	5590	0.74493	18.62(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	1617533	241.294	6032.34(AM)
38 Trichloroethene	130	5.214	5.214	(1.049)	2806452	454.298	11357.45(A)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	59946	8.72114	218.02
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	283014	45.7436	45.74
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	335608	52.1769	52.17
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	248466	46.8145	46.81
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	923267	48.7002	48.70
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	543009	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	805917	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	674697	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	349383	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).
A - Target compound detected but, quantitated amount exceeded maximum amount.
M - Compound response manually integrated.

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

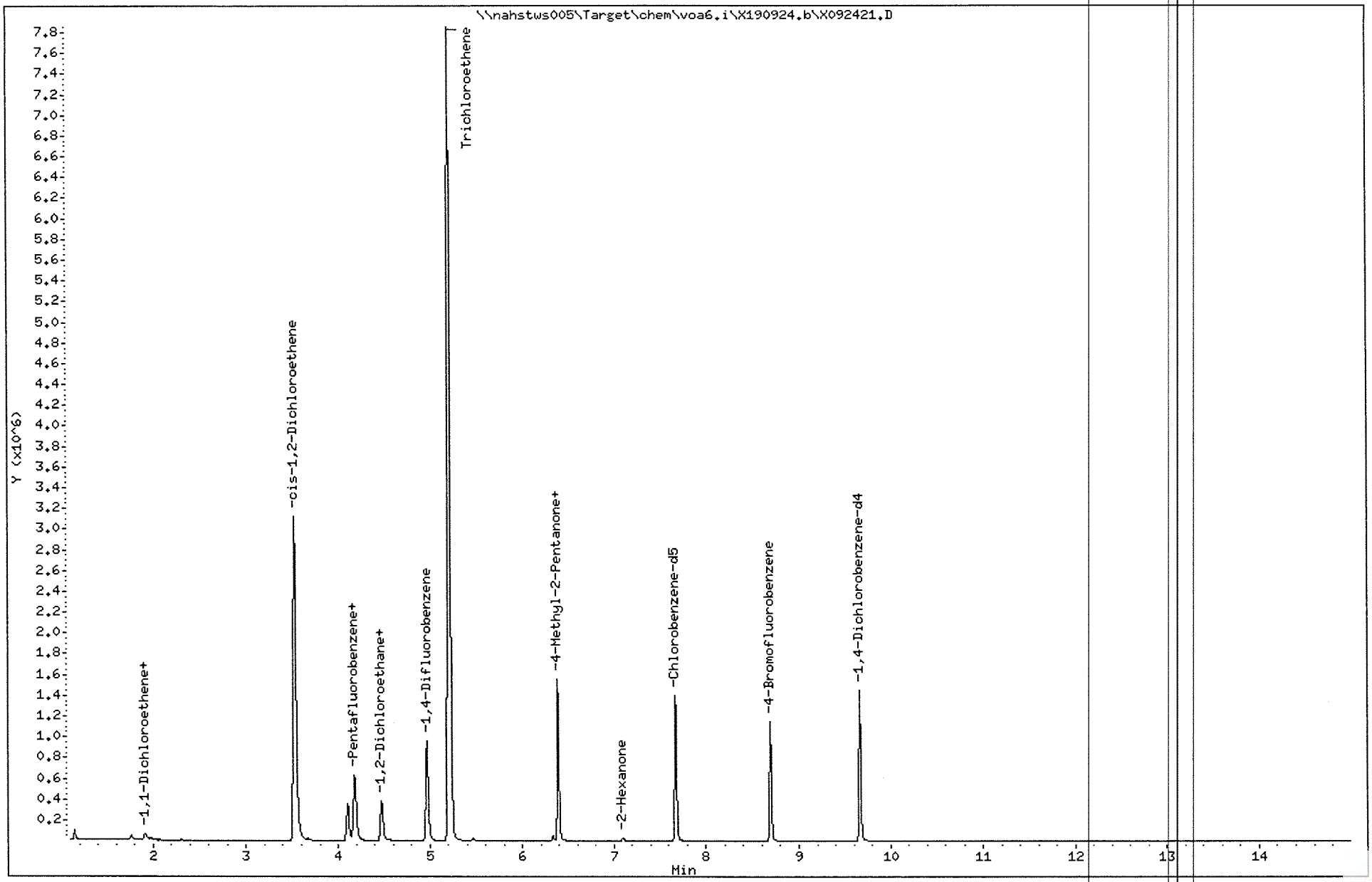
Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

Operator: PC

Column phase: DB624

Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

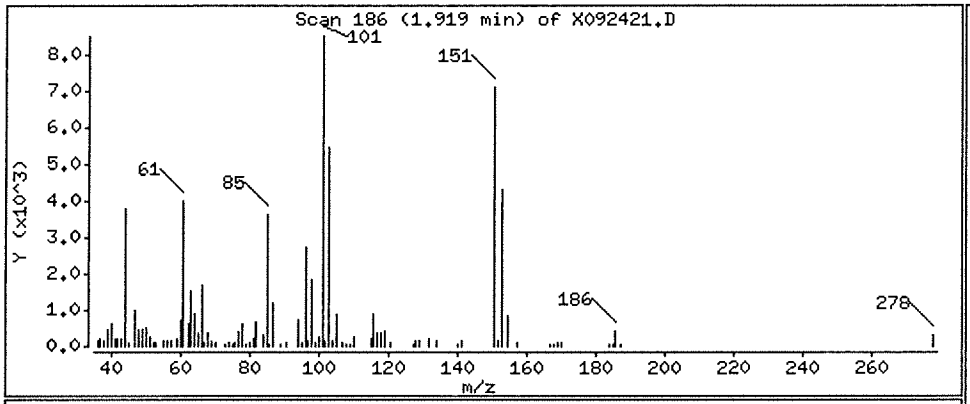
Operator: PC

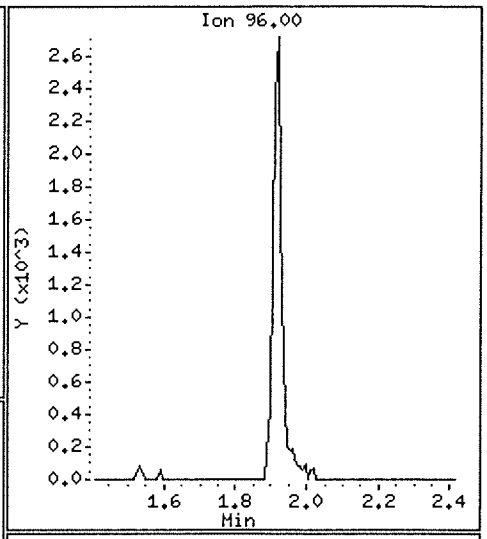
Column phase: DB624

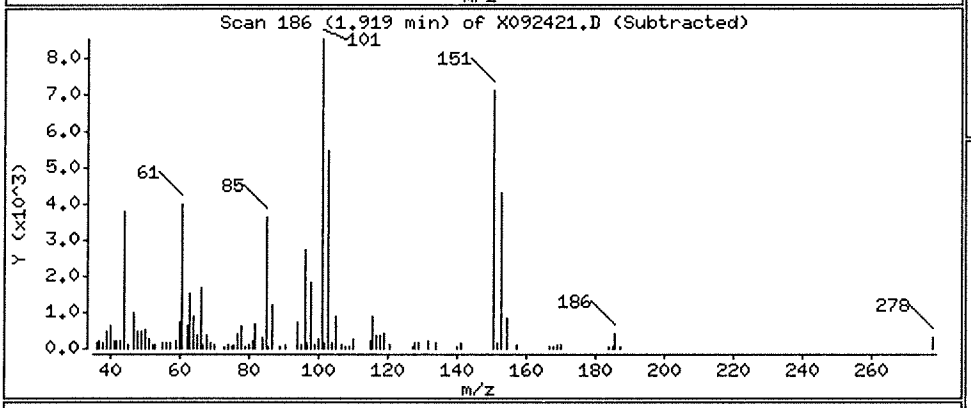
Column diameter: 0.18

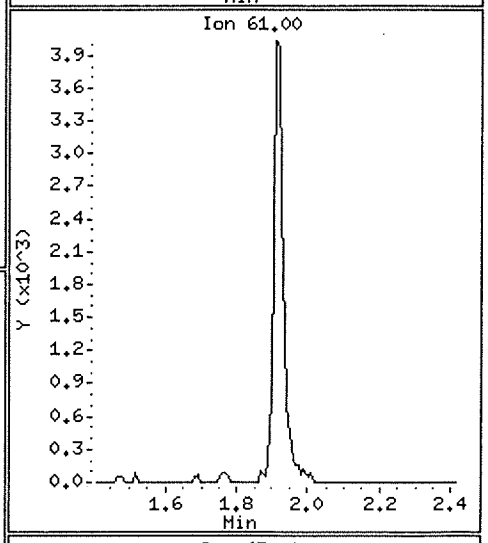
11 1,1-Dichloroethene

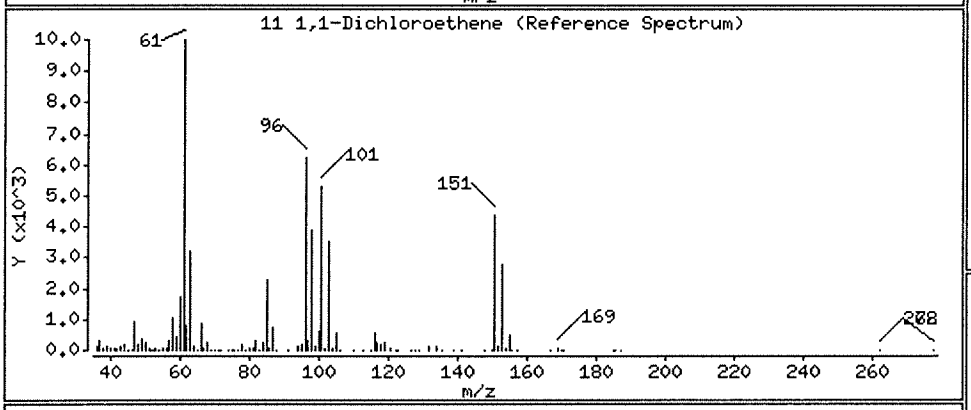
Concentration: 24.92 ug/l

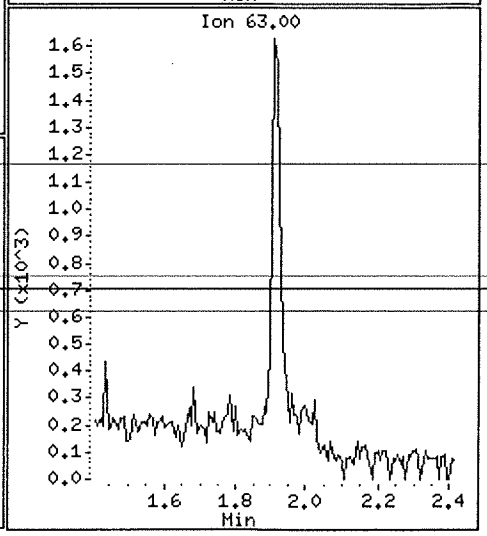


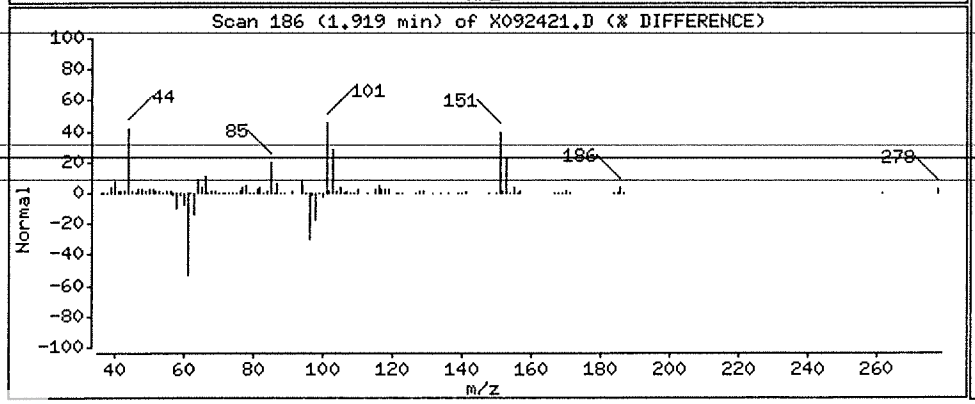












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

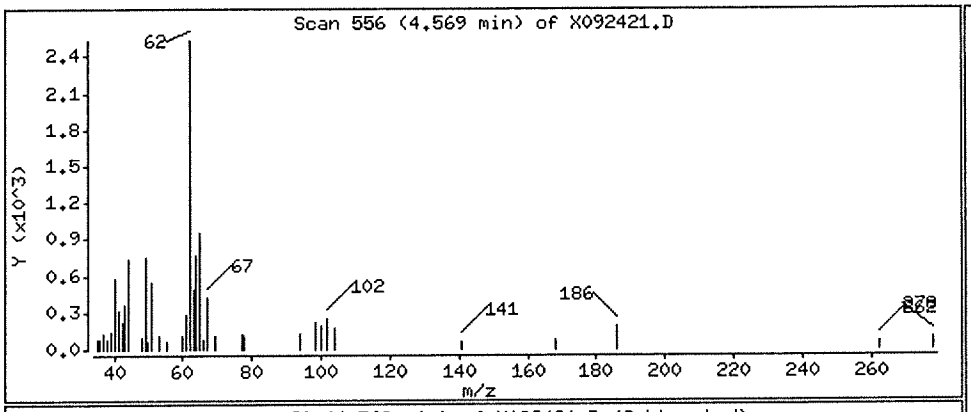
Operator: PC

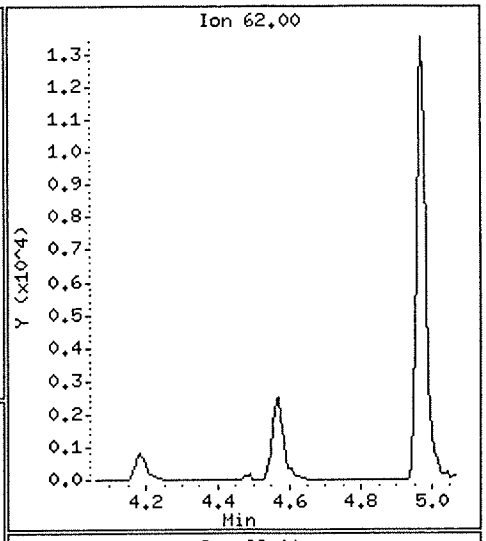
Column phase: DB624

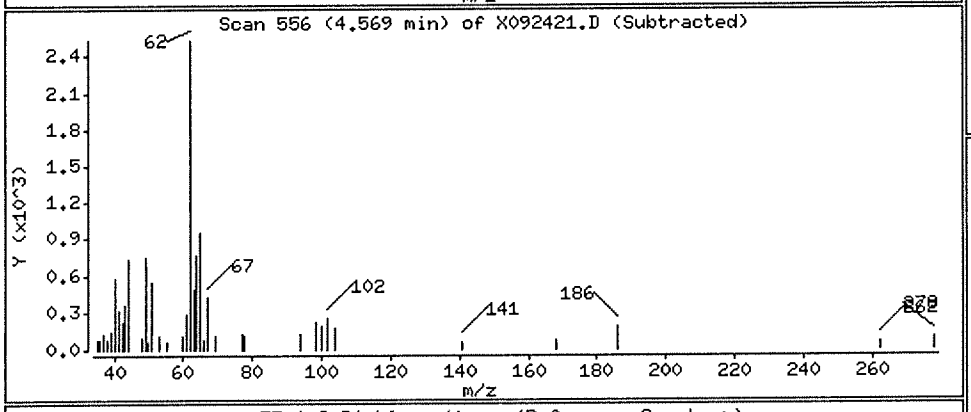
Column diameter: 0.18

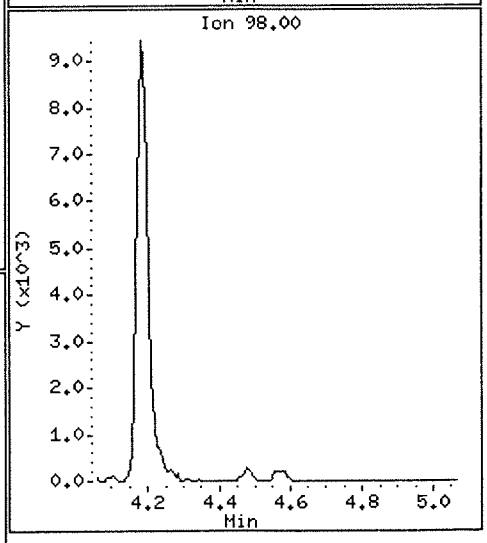
33 1,2-Dichloroethane

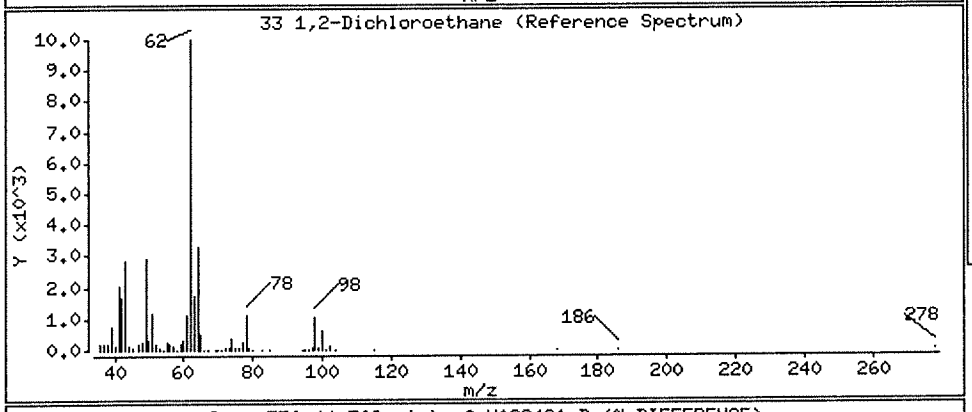
Concentration: 18.62 ug/l

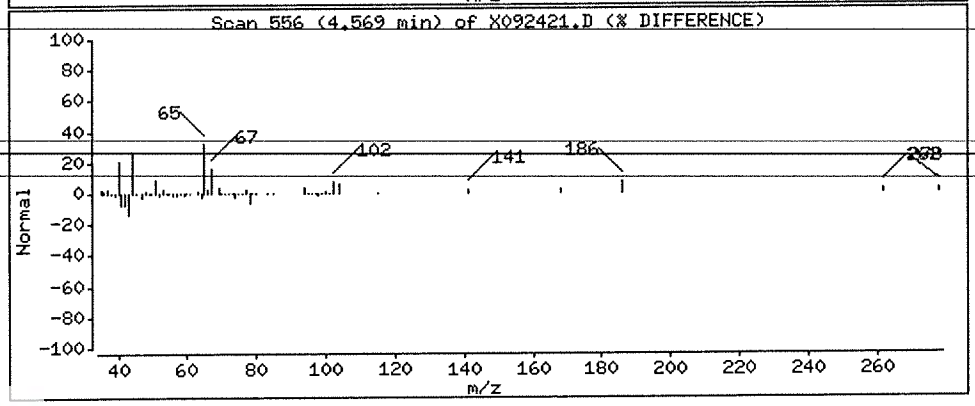












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

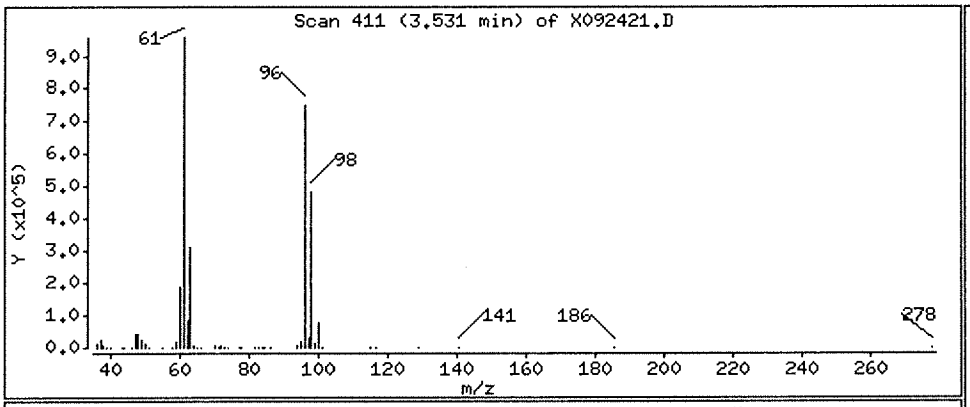
Operator: PC

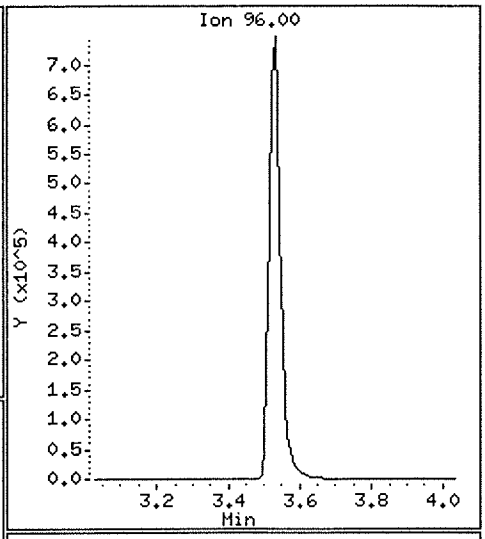
Column phase: DB624

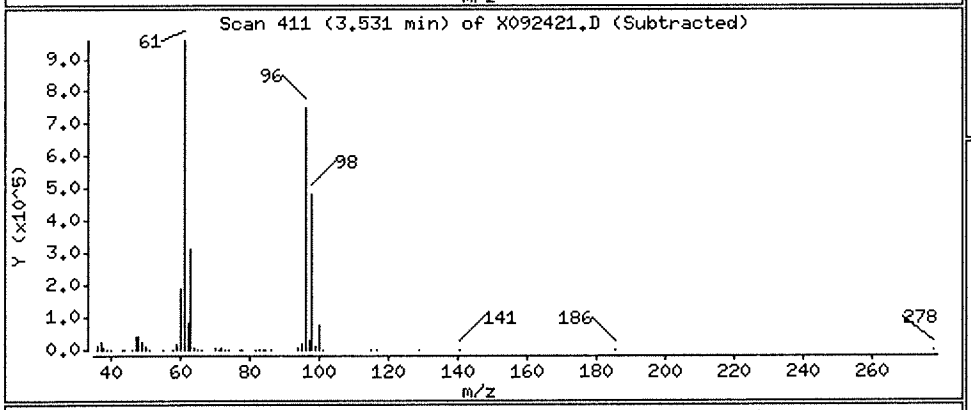
Column diameter: 0.18

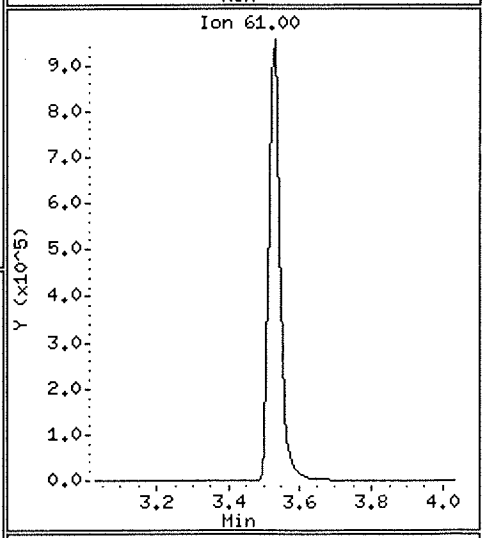
27 cis-1,2-Dichloroethene

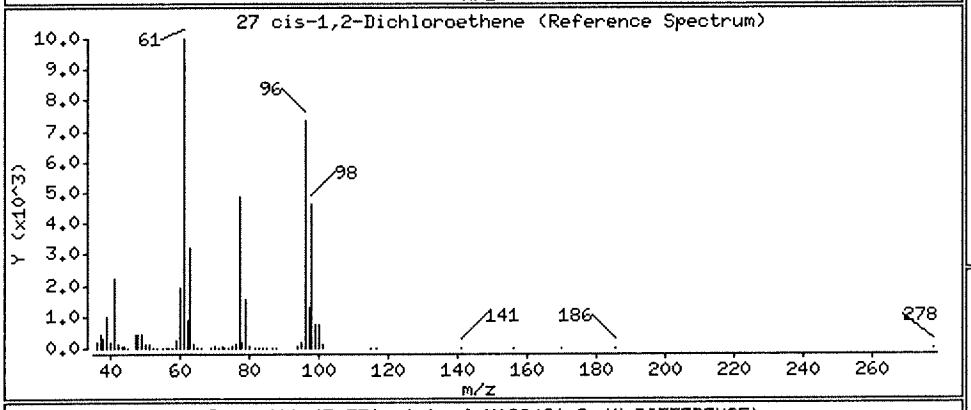
Concentration: 6032.34 ug/l

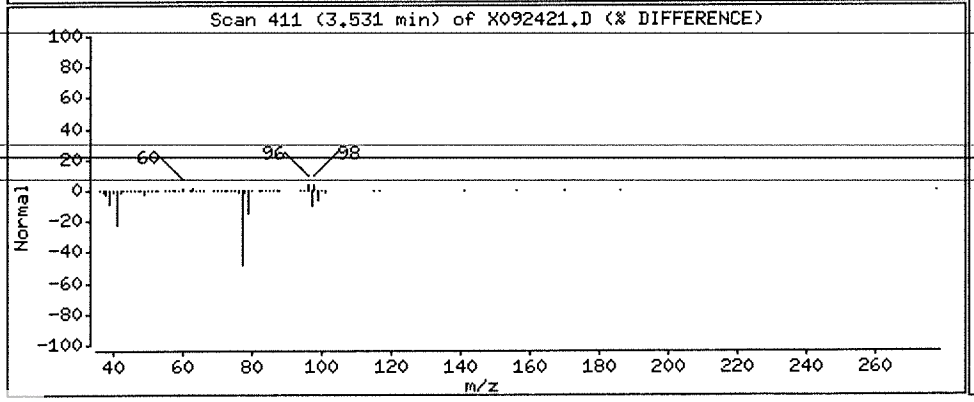


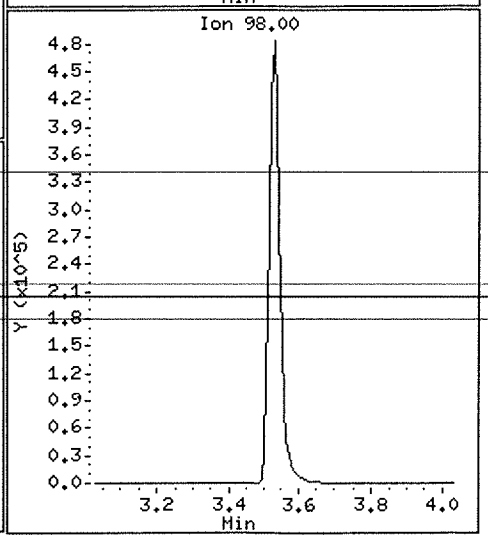












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

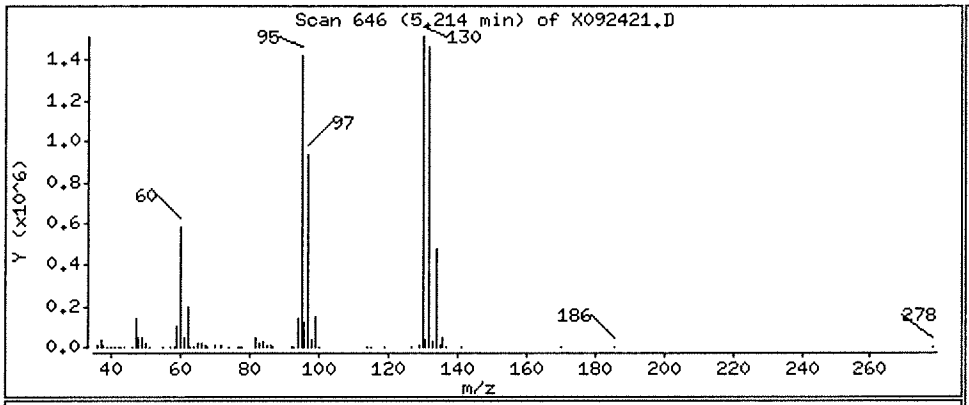
Operator: PC

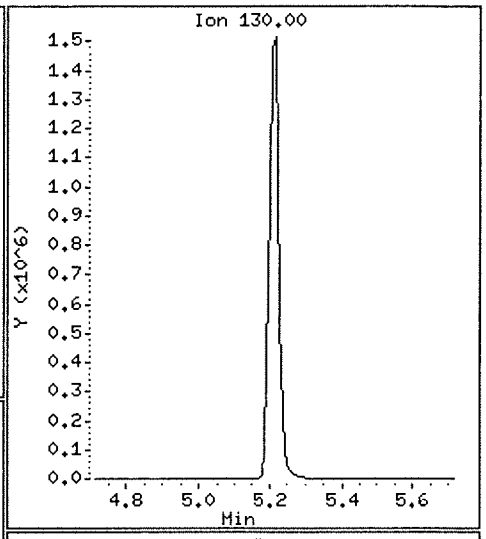
Column phase: DB624

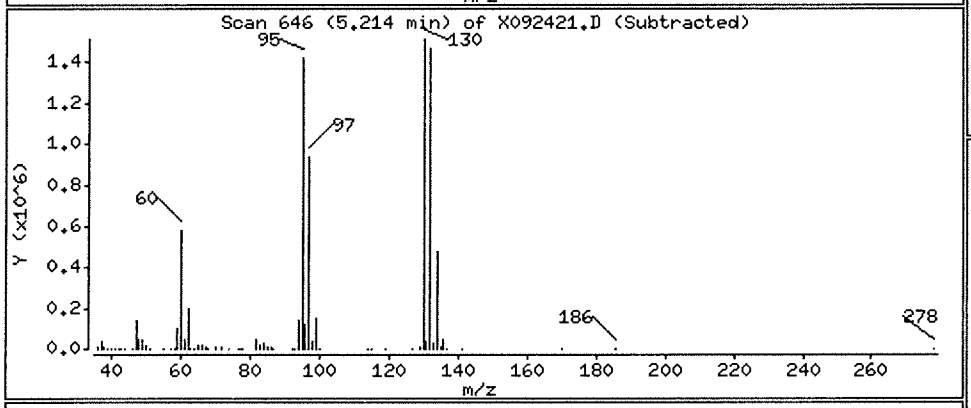
Column diameter: 0.18

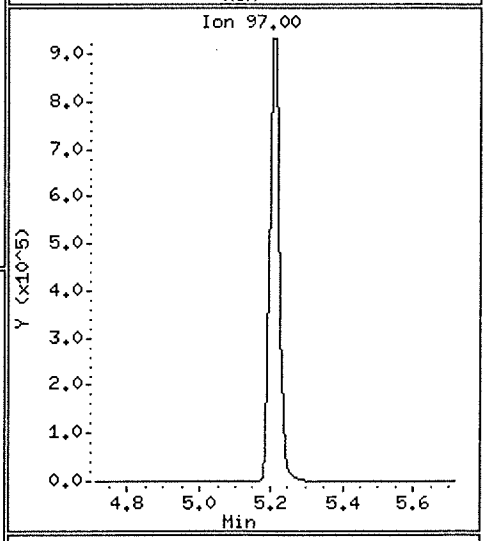
38 Trichloroethene

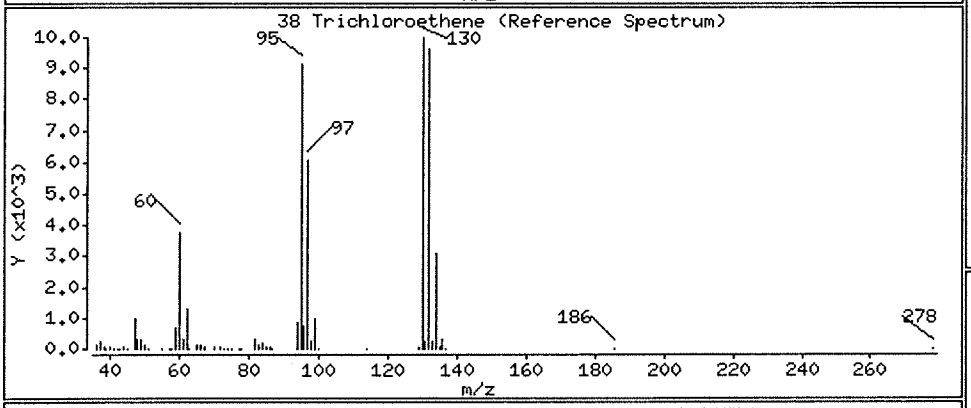
Concentration: 11357.45 ug/l

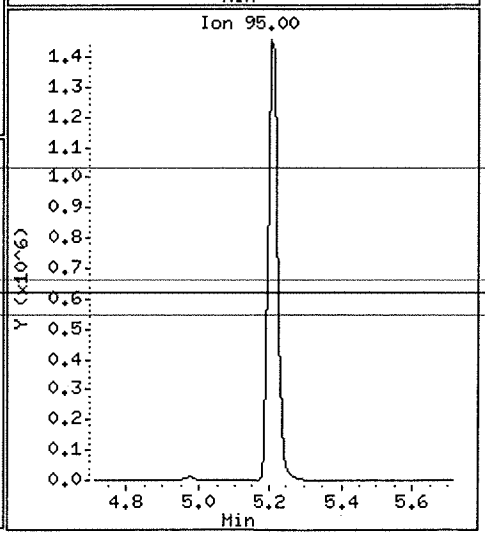


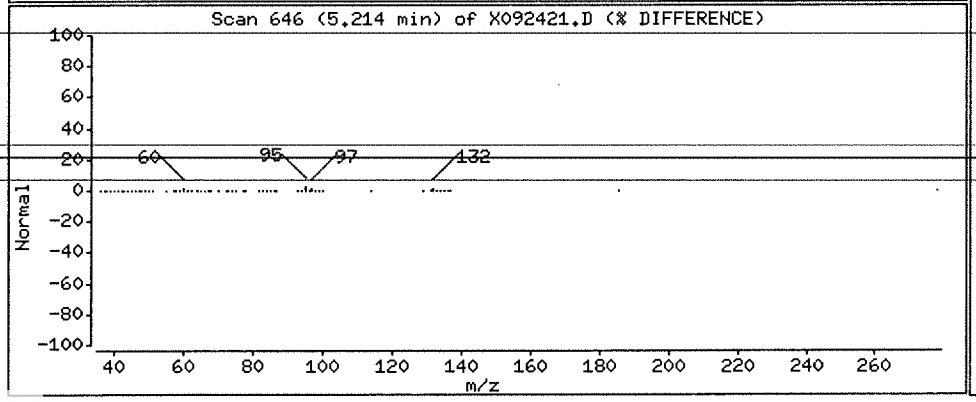












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092421.D

Date : 24-SEP-2019 19:11

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

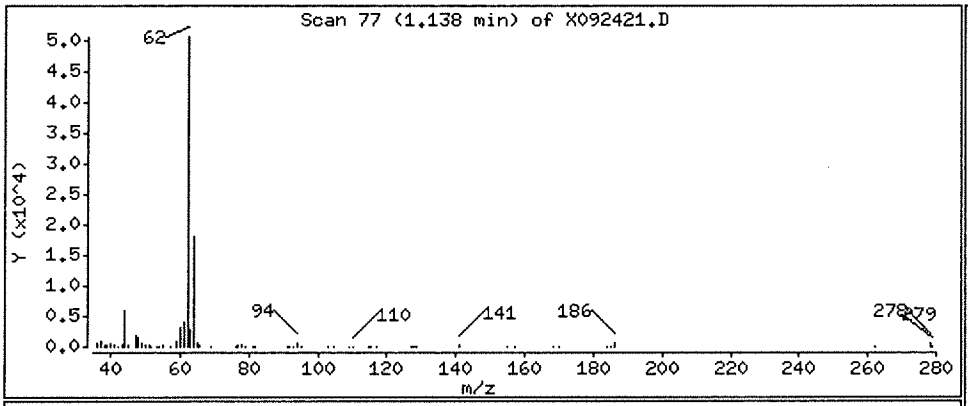
Operator: PC

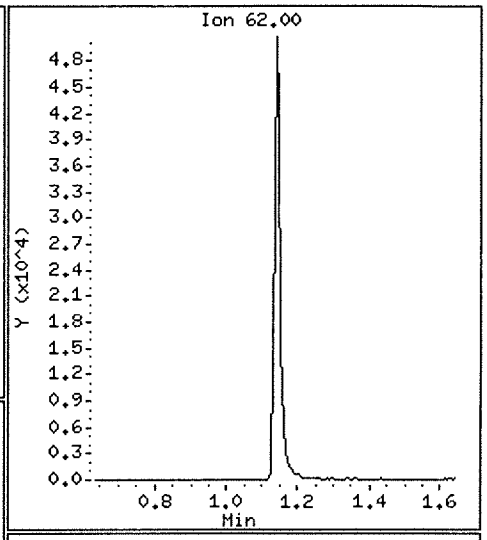
Column phase: DB624

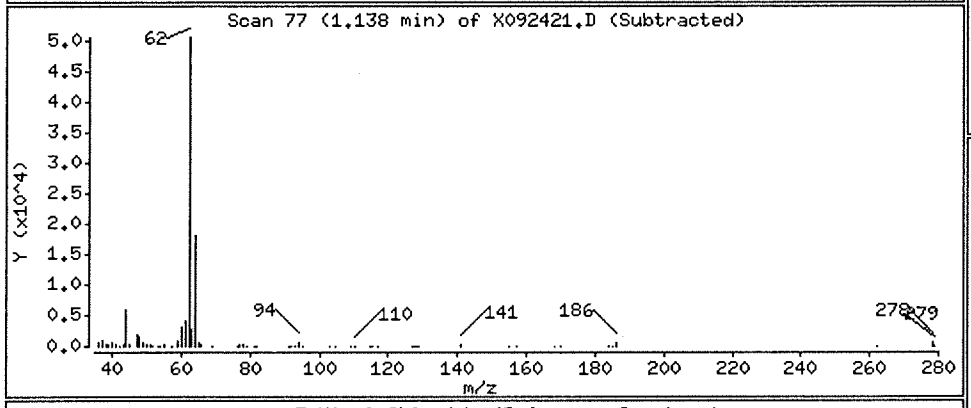
Column diameter: 0.18

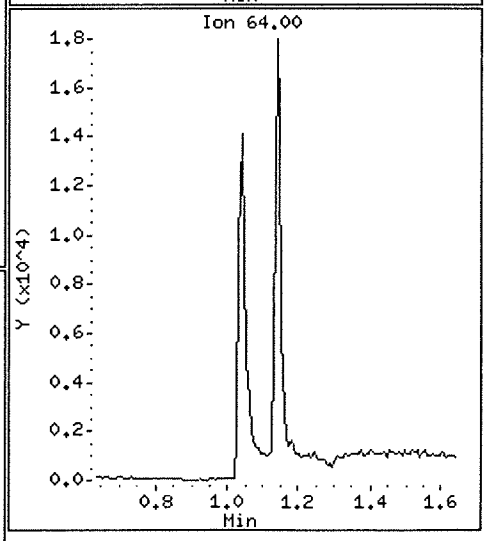
5 Vinyl Chloride

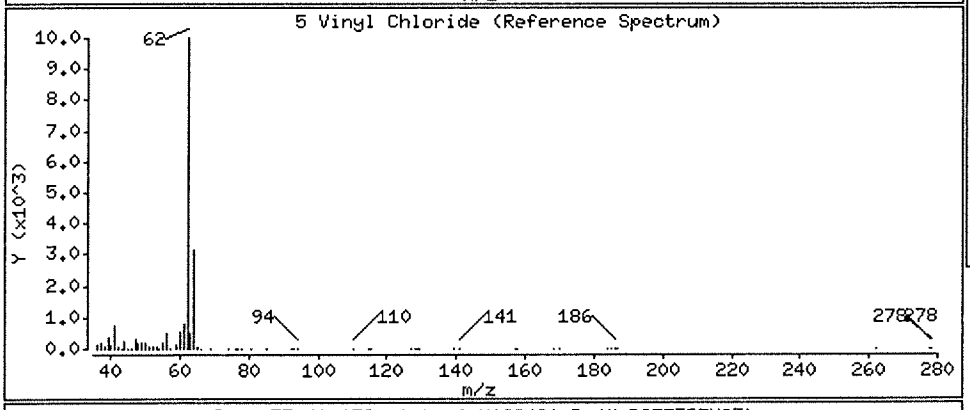
Concentration: 218.02 ug/l

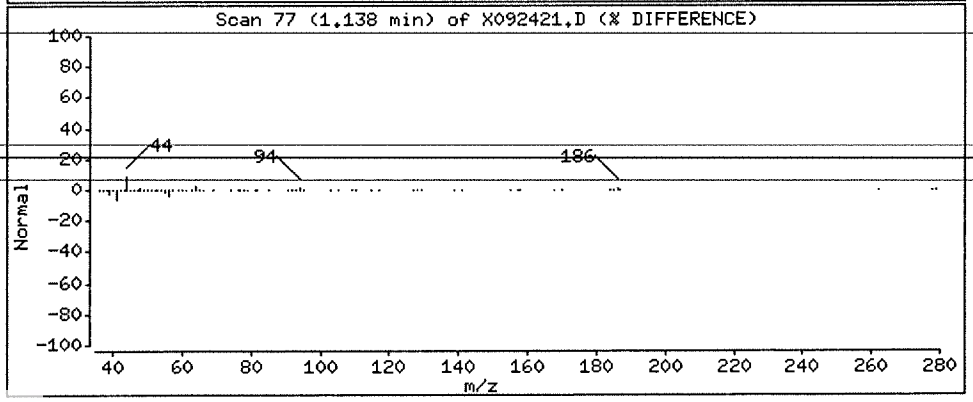






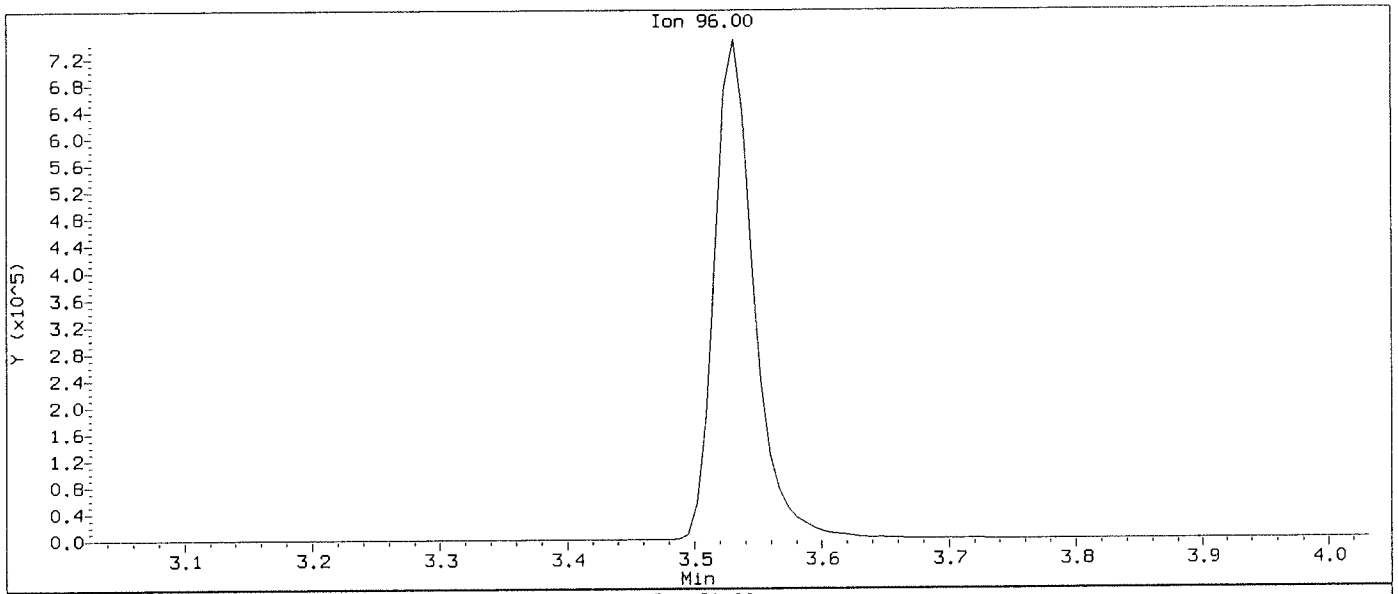


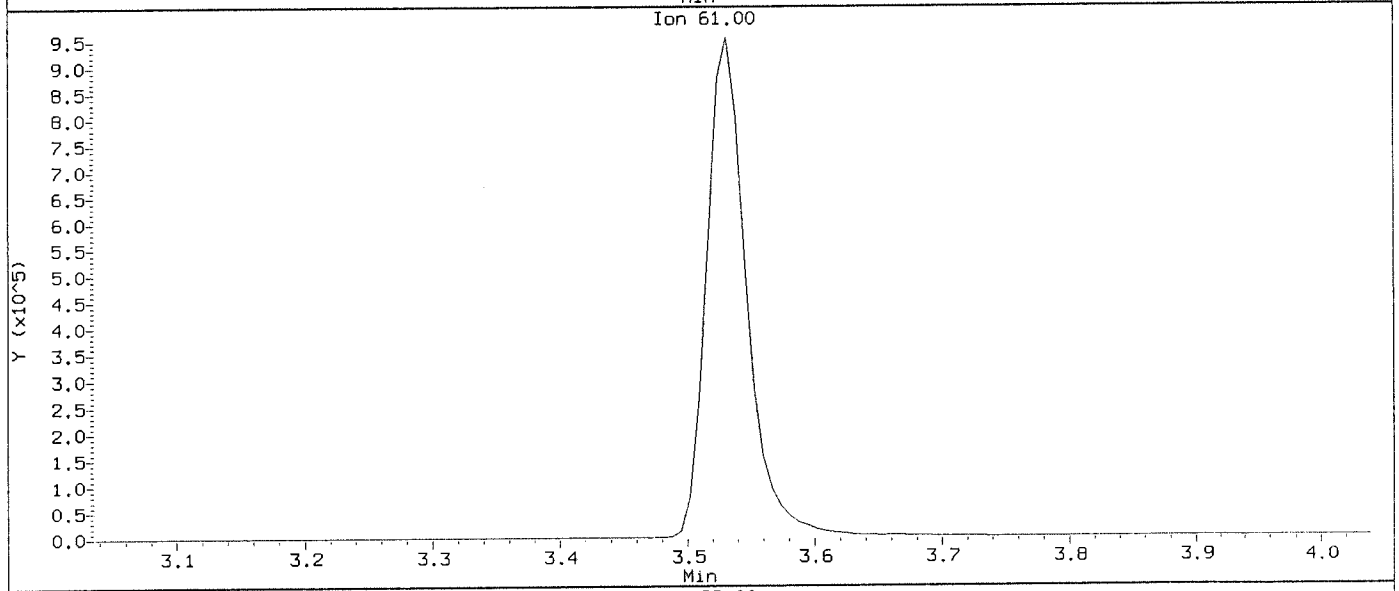


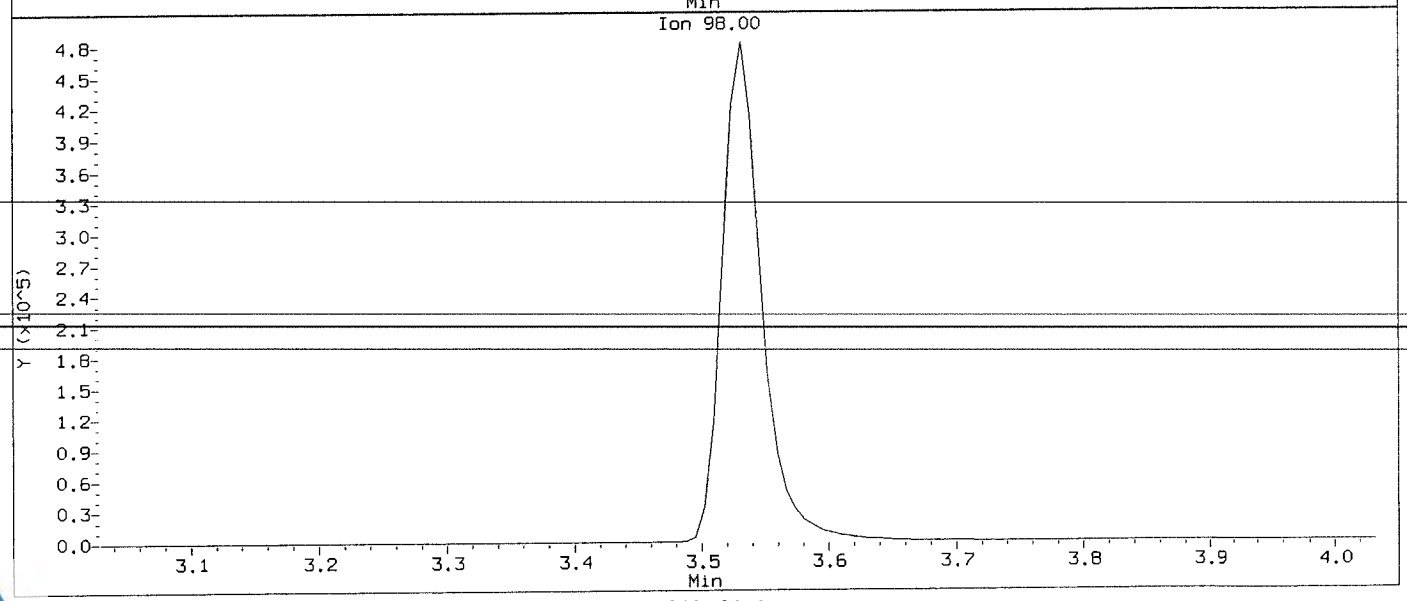


Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\BEFORE2\X092421.D
Injection Date: 24-SEP-2019 19:11
Instrument: voa6.i
Client Sample ID: HS19090860-02

Compound: cis-1,2-Dichloroethene
CAS Number: 156-59-2







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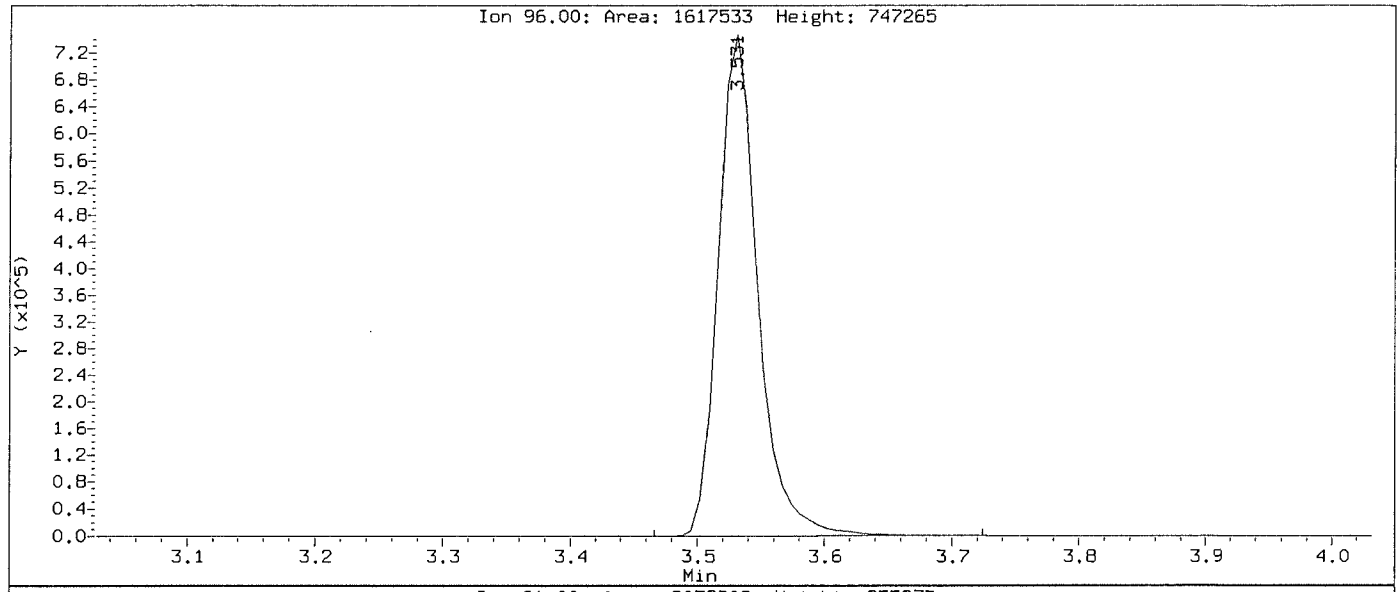
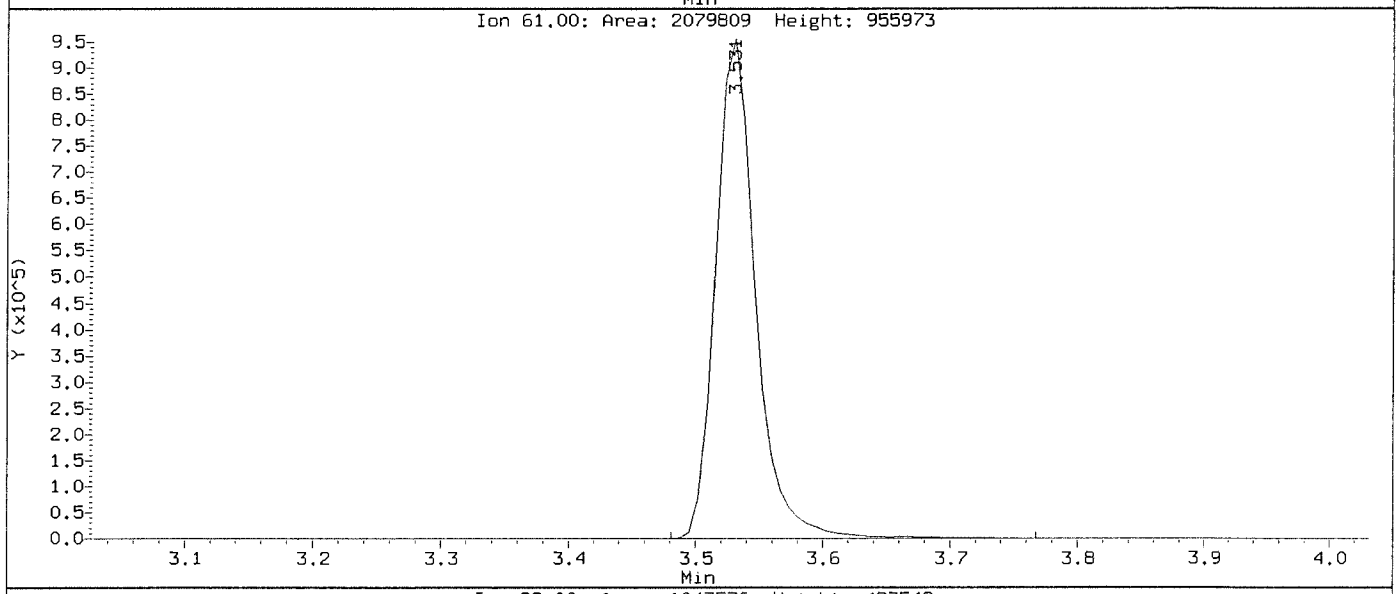
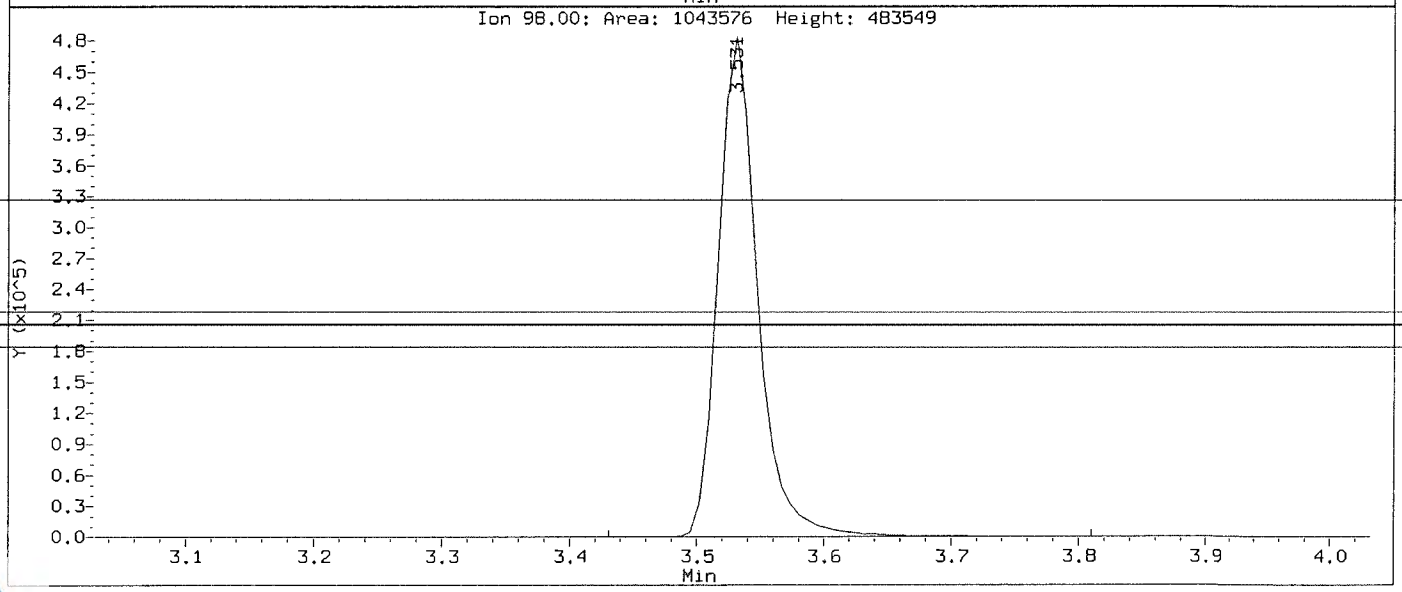
Injection Date: 24-SEP-2019 19:11
Instrument: voa6.i
Client Sample ID: HS19090860-02

Compound: cis-1,2-Dichloroethene
CAS Number: 156-59-2







Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092422.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092422.D
Lab Smp Id: HS19090860-01MS Client Smp ID: HS19090860-01MS
Inj Date : 24-SEP-2019 19:35
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-01MS;HS19090860-01MS;3;;MS
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 23 QC Sample: MS
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

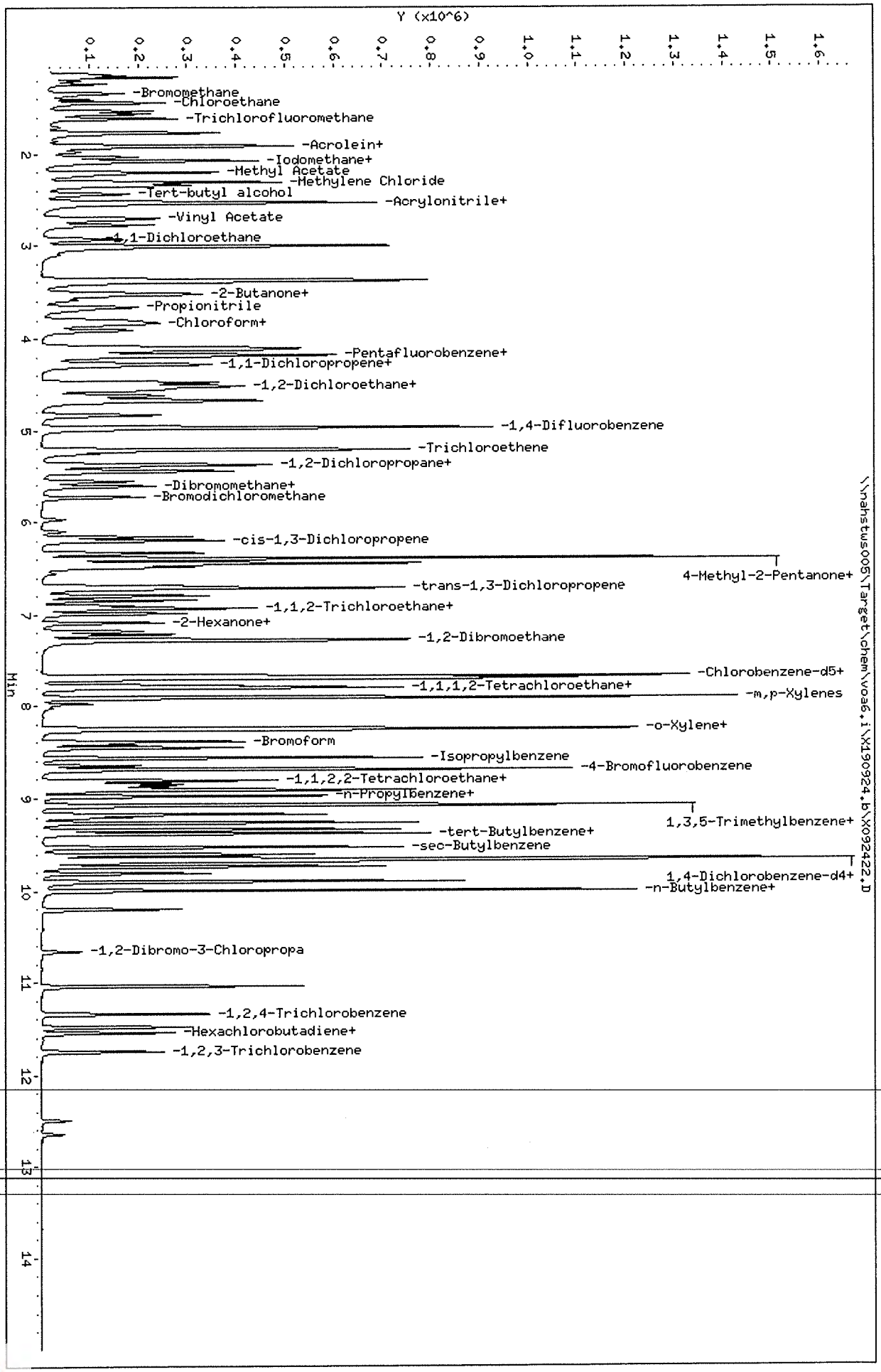
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	74475	20.0258	20.02
11 1,1-Dichloroethene	96	1.912	1.911	(0.457)	79965	18.2147	18.21
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	125586	17.8623	17.86
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	114641	18.3162	18.31
17 Methylene Chloride	84	2.306	2.305	(0.551)	98358	16.9049	16.90
38 Trichloroethene	130	5.214	5.214	(1.049)	263512	45.5275	45.52
5 Vinyl Chloride	62	1.138	1.138	(0.272)	97833	15.2441	15.24
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	265557	45.9759	45.97
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	306142	50.9905	50.99
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	236565	47.7552	47.75
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	887247	50.1643	50.16
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	506995	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	755092	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	629450	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	310727	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092422.D
Date : 24-SEP-2019 19:35
Client ID: HS19090860-01MS
Sample Info: HS19090860-01MS;HS19090860-01MS;3;;MS
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092423.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092423.D
Lab Smp Id: HS19090860-01MSD Client Smp ID: HS19090860-01MSD
Inj Date : 24-SEP-2019 19:59
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-01MSD;HS19090860-01MSD;3;;MSD
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 23 QC Sample: MSD
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

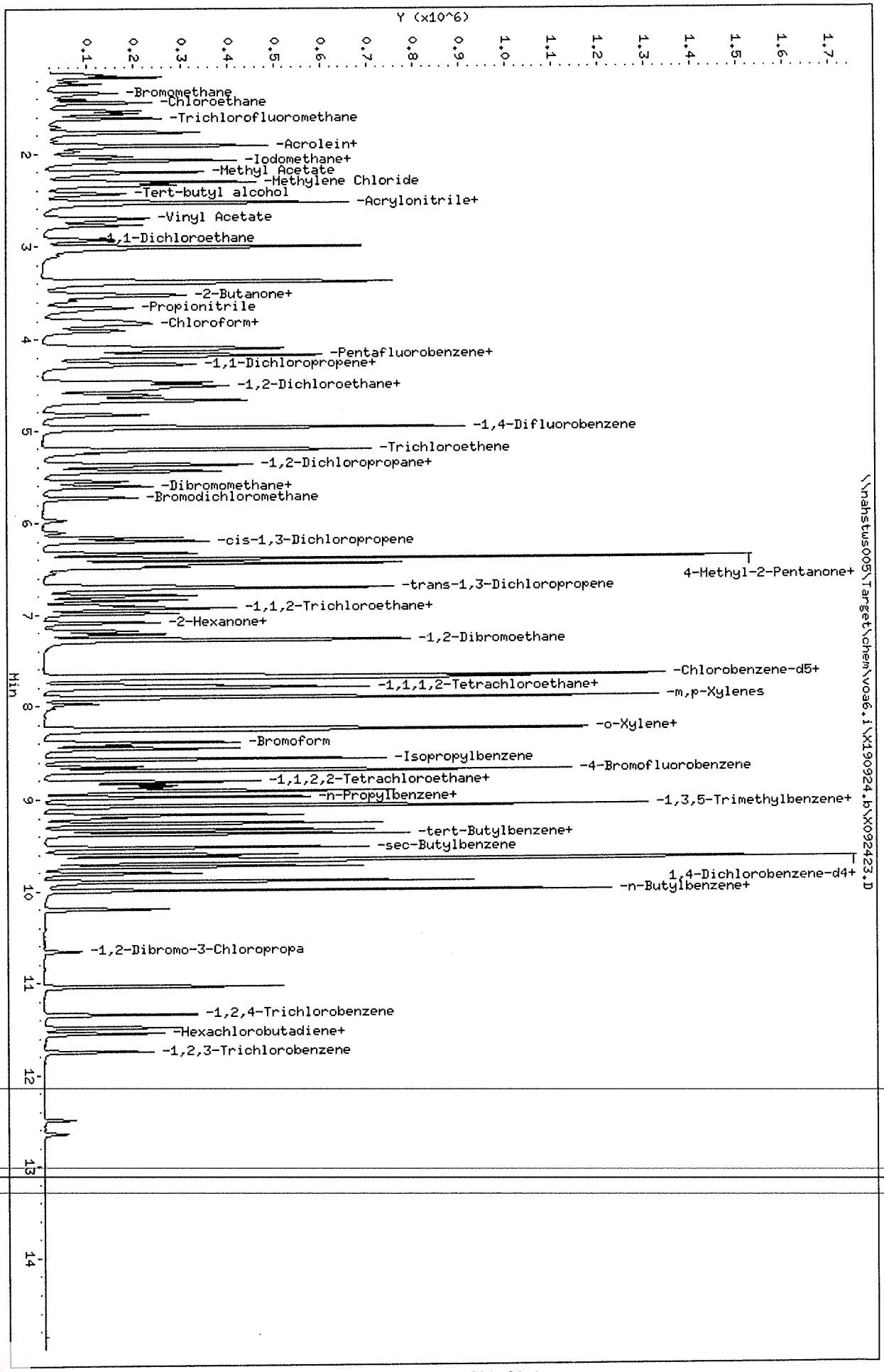
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	73988	19.1302	19.13
11 1,1-Dichloroethene	96	1.912	1.911	(0.457)	74659	16.8341	16.83
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	121334	17.2915	17.29
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	108666	17.1861	17.18
17 Methylene Chloride	84	2.305	2.305	(0.551)	93849	15.8719	15.87
38 Trichloroethene	130	5.214	5.214	(1.049)	249342	43.1641	43.16
5 Vinyl Chloride	62	1.138	1.138	(0.272)	91802	14.1597	14.15
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	265771	45.5386	45.53
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	323446	51.9401	51.94
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	238037	47.5632	47.56
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	902967	49.2011	49.20
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	512173	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	753609	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	653144	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	336239	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092423.D
Date : 24-SEP-2019 19:59
Client ID: HS19090860-01HSD
Sample Info: HS19090860-01HSD;HS19090860-01HSD;3;;HSD
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092424.D
Lab Smp Id: HS19090860-02 Client Smp ID: HS19090860-02
Inj Date : 24-SEP-2019 20:23
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-02;HS19090860-02;;;
Misc Info : HS18090001;WATER;0;250;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 24
Dil Factor: 250.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	250.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

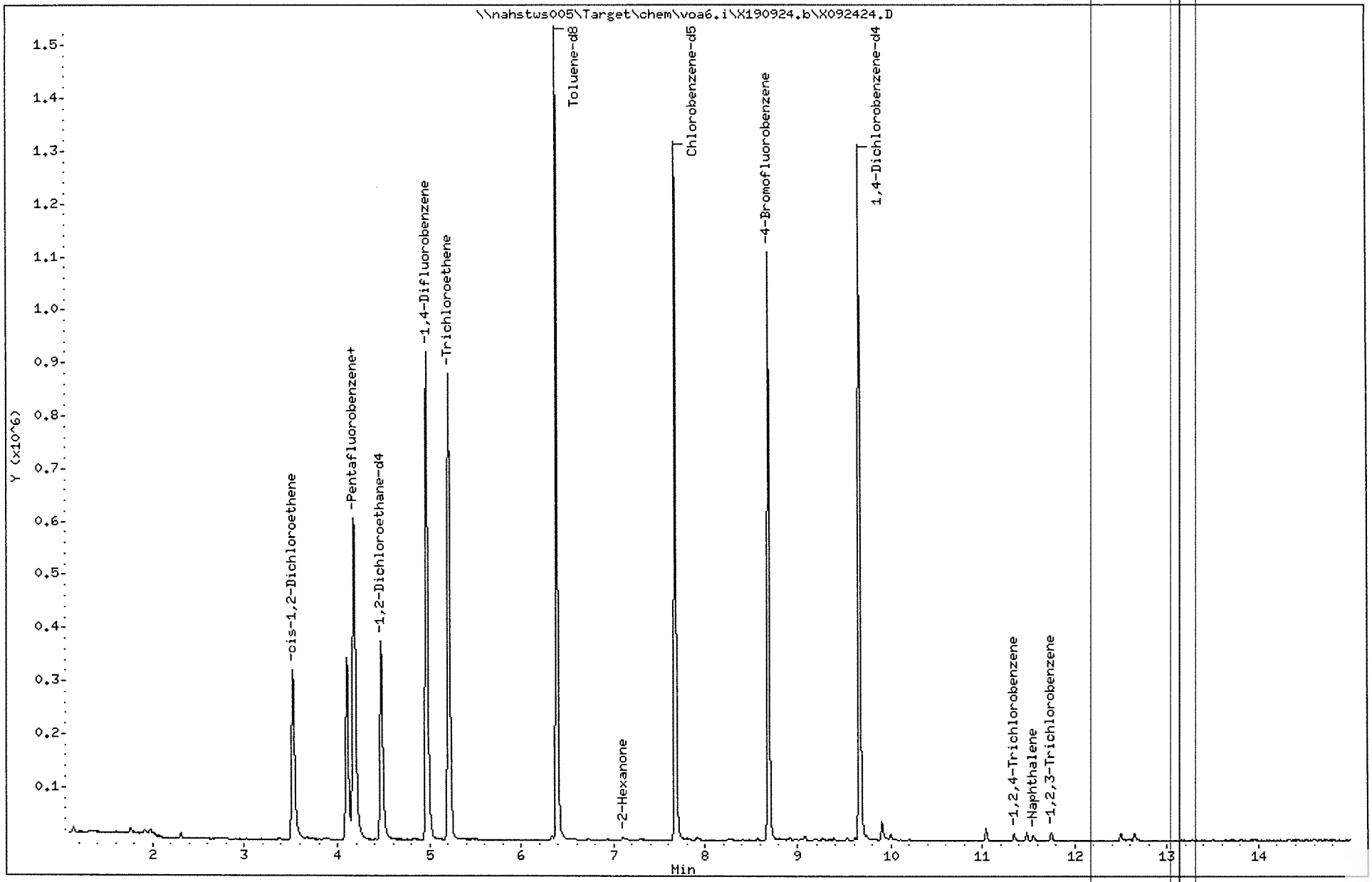
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	169177	26.2192	6554.80
38 Trichloroethene	130	5.214	5.214	(1.049)	312796	53.0026	13250.64
5 Vinyl Chloride	62	1.138	1.138	(0.272)	6290	0.95071	237.67(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	273834	45.9879	45.98
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	321395	52.2800	52.27
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	240715	47.1252	47.12
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	913296	50.4018	50.40
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	522663	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	769906	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.678	(1.000)	644878	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	324028	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092424.D
Date : 24-SEP-2019 20:23
Client ID: HS19090860-02
Sample Info: HS19090860-02;HS19090860-02;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092424.D

Date : 24-SEP-2019 20:23

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

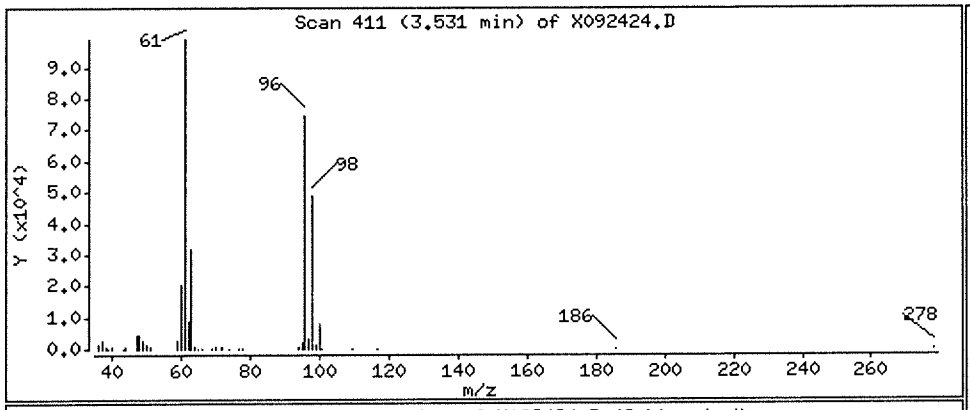
Operator: PC

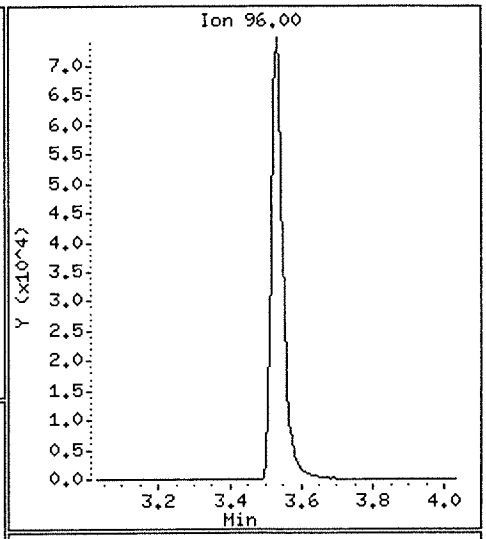
Column phase: DB624

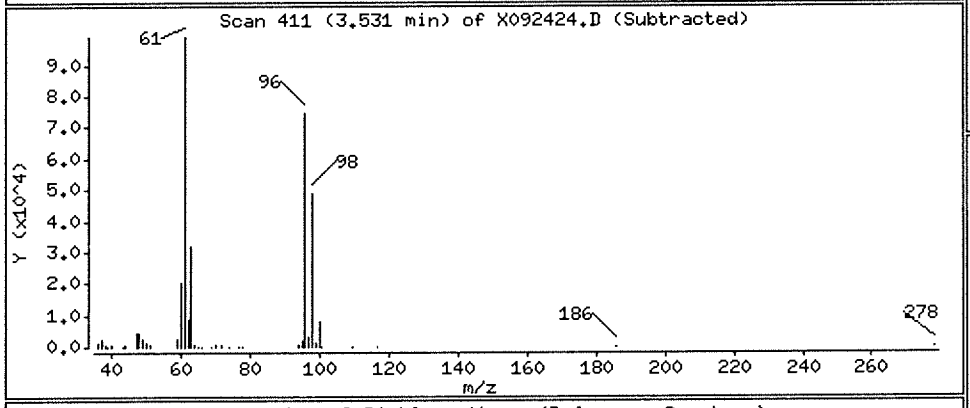
Column diameter: 0.18

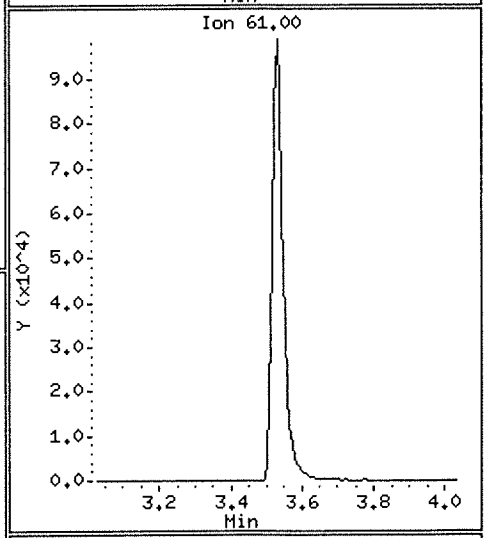
27 cis-1,2-Dichloroethene

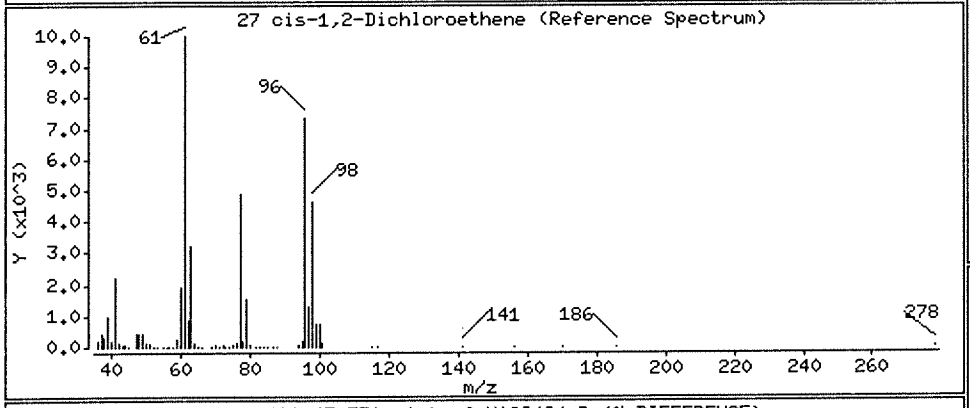
Concentration: 6554.80 ug/l

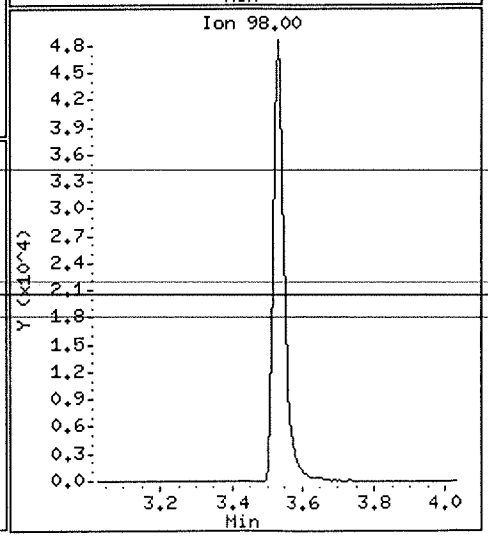


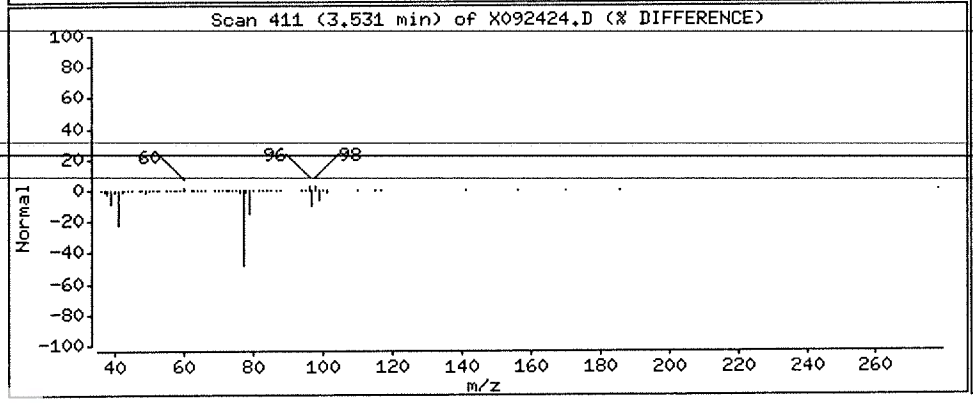












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092424.D

Date : 24-SEP-2019 20:23

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

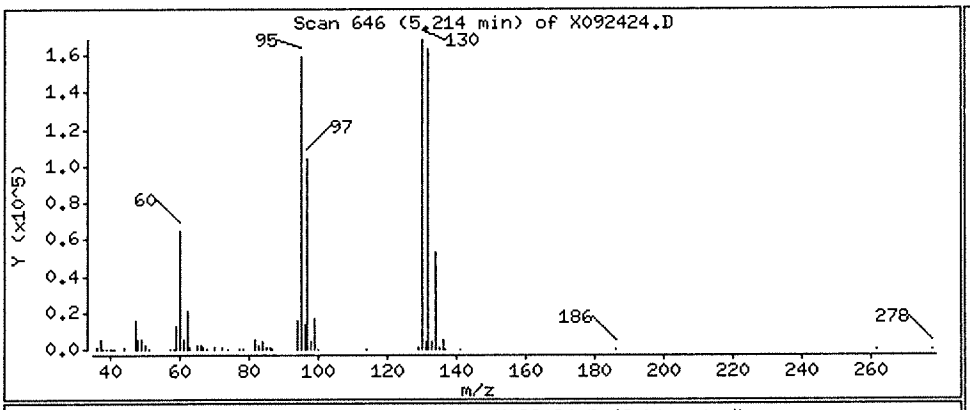
Operator: PC

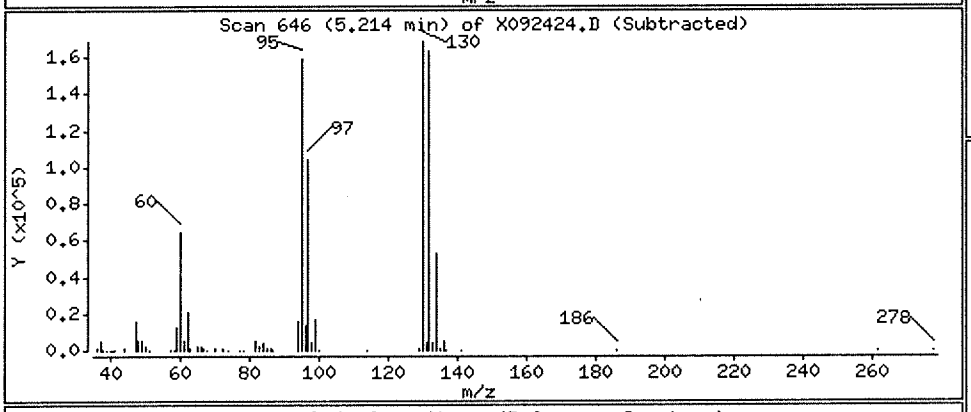
Column phase: DB624

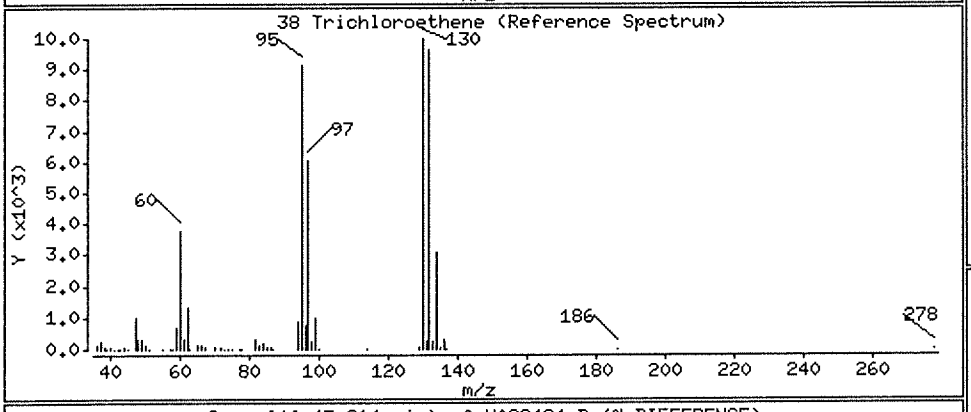
Column diameter: 0.18

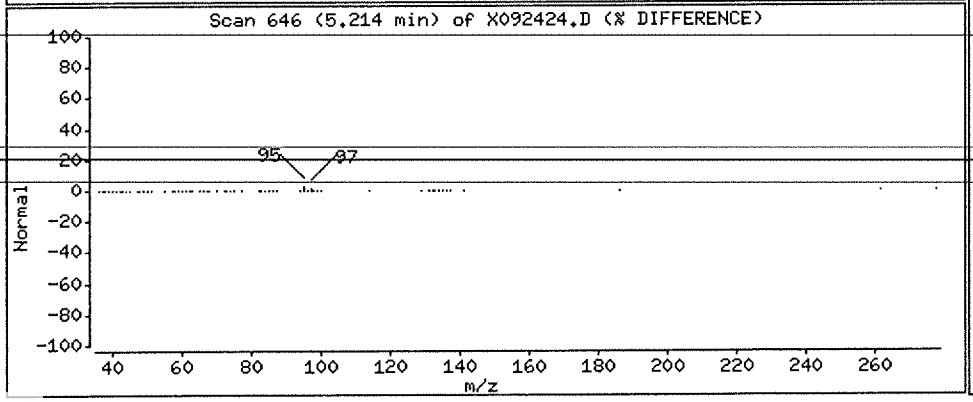
38 Trichloroethene

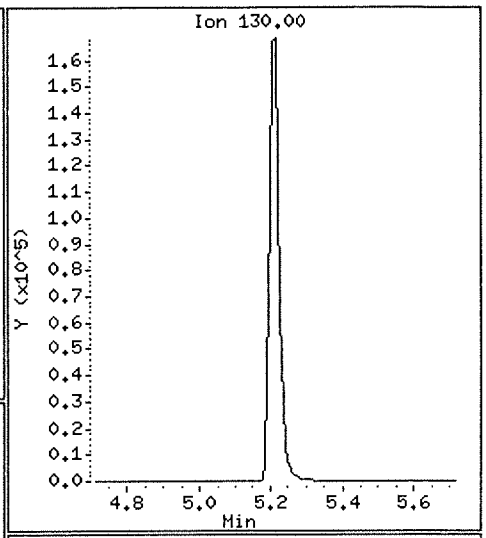
Concentration: 13250.64 ug/l

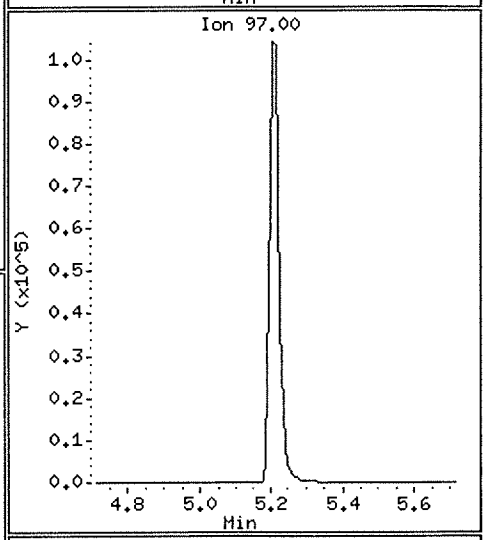


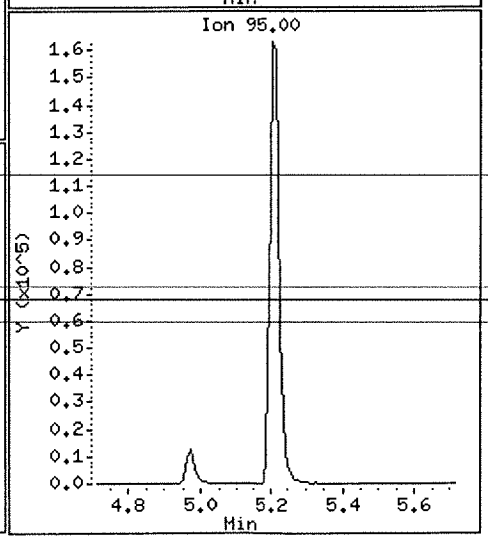












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092424.D

Date : 24-SEP-2019 20:23

Client ID: HS19090860-02

Instrument: voa6.i

Sample Info: HS19090860-02;HS19090860-02;;;

Purge Volume: 5.0

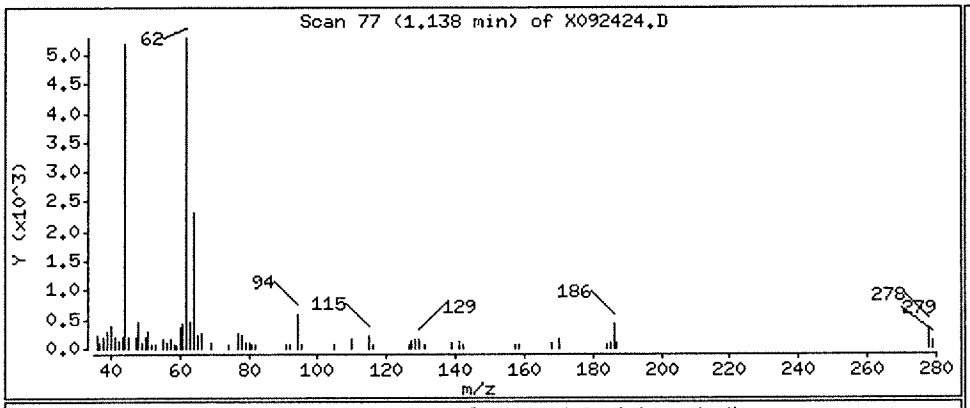
Operator: PC

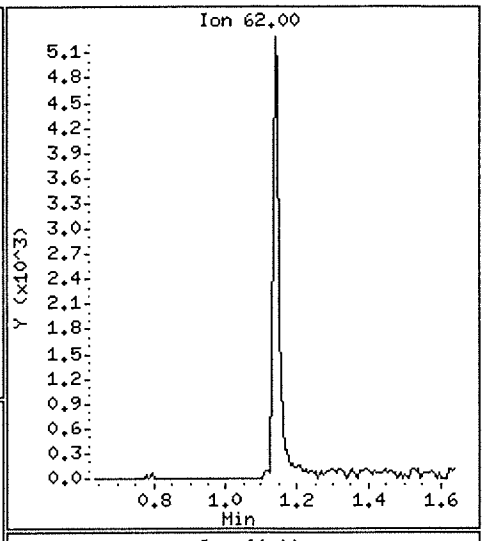
Column phase: DB624

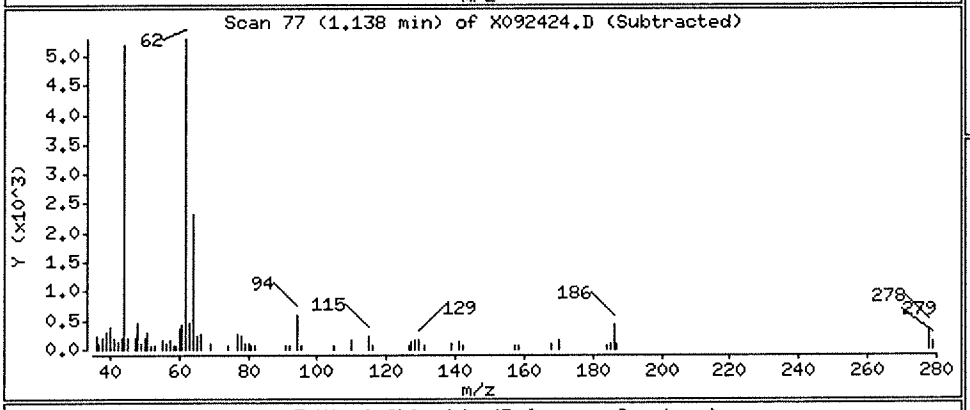
Column diameter: 0.18

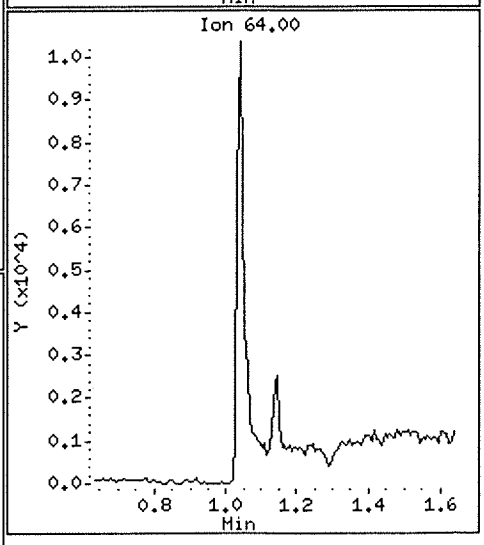
5 Vinyl Chloride

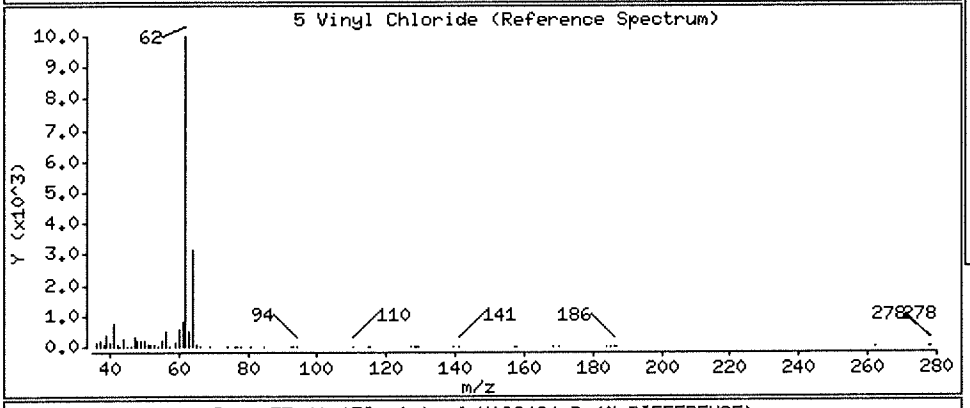
Concentration: 237.67 ug/l

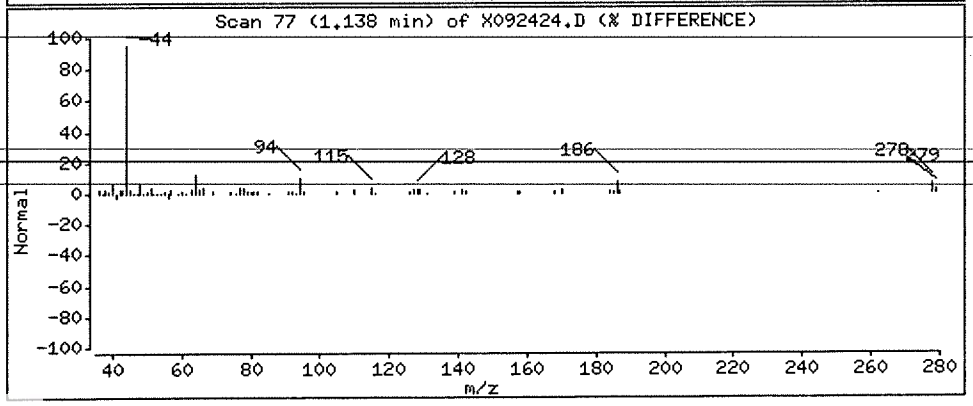












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D Page 1
Report Date: 09-Oct-2019 18:44

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Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D
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Inj Date : 24-SEP-2019 20:47
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-05;HS19090860-05;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 25
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

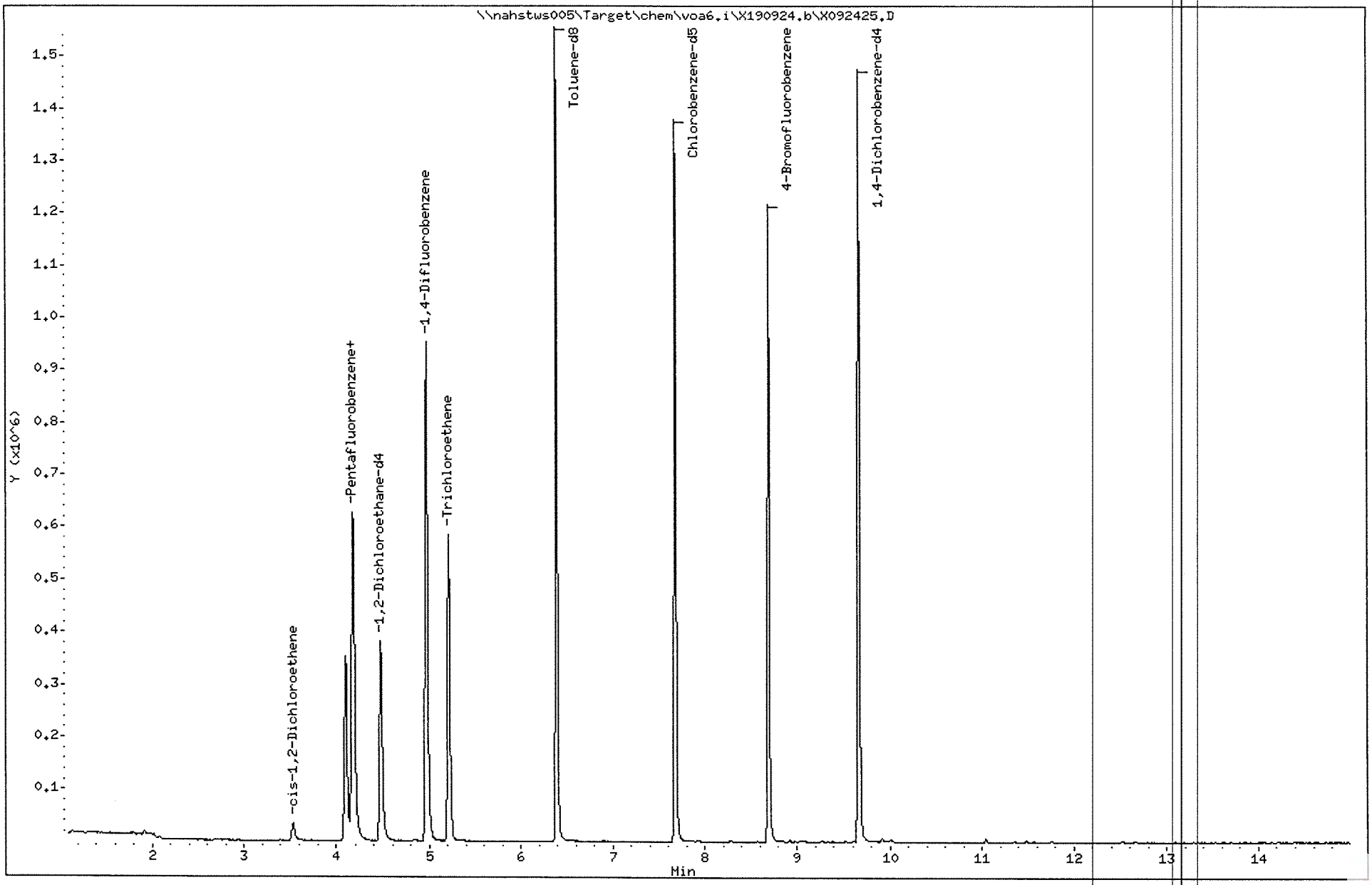
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.846)	17643	2.65052	2.65(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	209202	34.2415	34.24
5 Vinyl Chloride	62	1.138	1.138	(0.272)	2989	0.43793	0.43(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	280804	45.7072	45.70
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	343661	53.0084	53.00
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	247786	47.0208	47.02
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	943987	49.3838	49.38
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	539189	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	797051	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	680289	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	353833	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D
Date : 24-SEP-2019 20:47
Client ID: HS19090860-05
Sample Info: HS19090860-05;HS19090860-05;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D

Date : 24-SEP-2019 20:47

Client ID: HS19090860-05

Instrument: voa6.i

Sample Info: HS19090860-05;HS19090860-05;;;

Purge Volume: 5.0

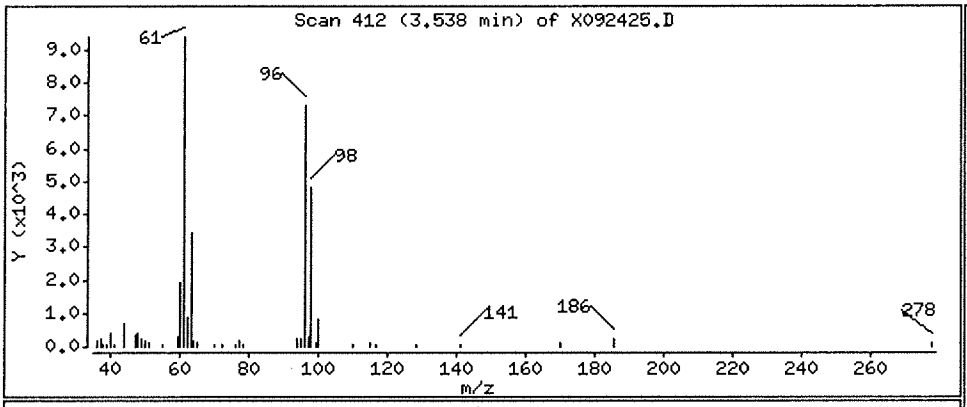
Operator: PC

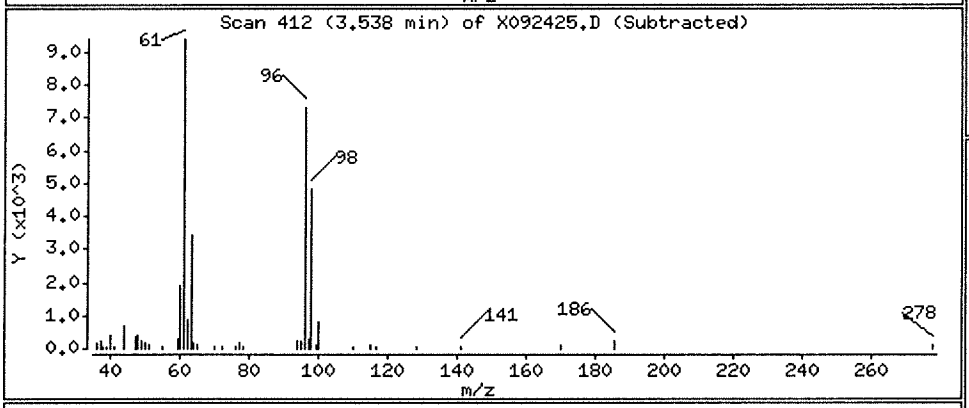
Column phase: DB624

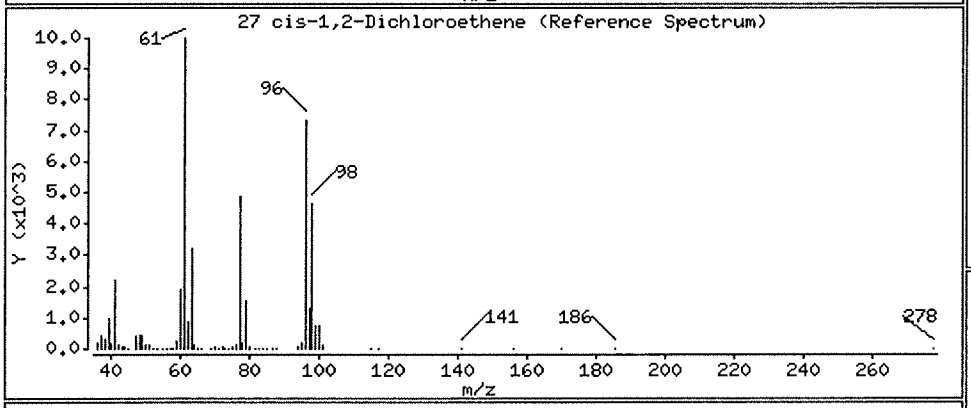
Column diameter: 0.18

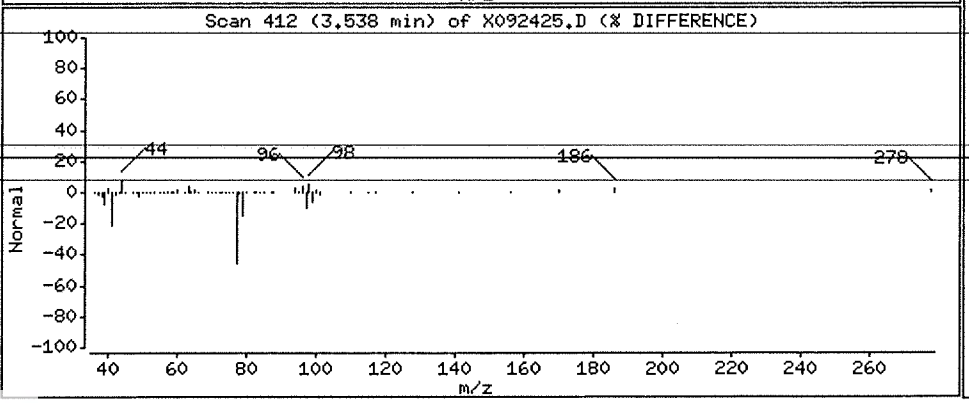
27 cis-1,2-Dichloroethene

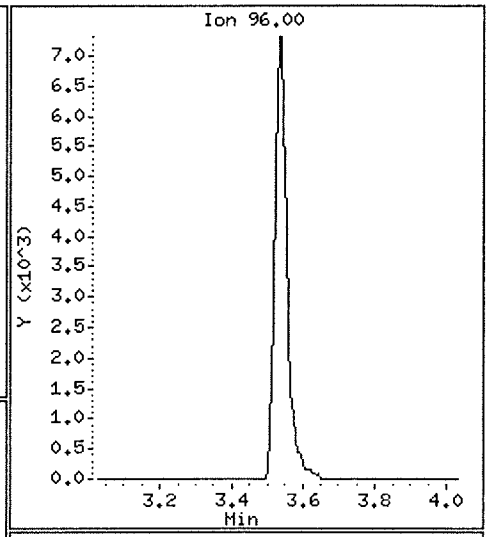
Concentration: 2.65 ug/l

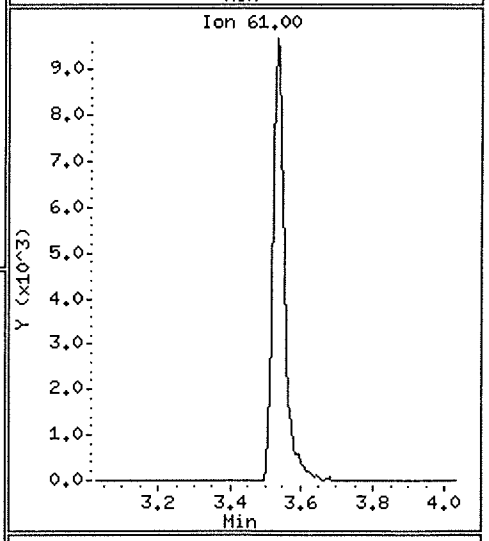


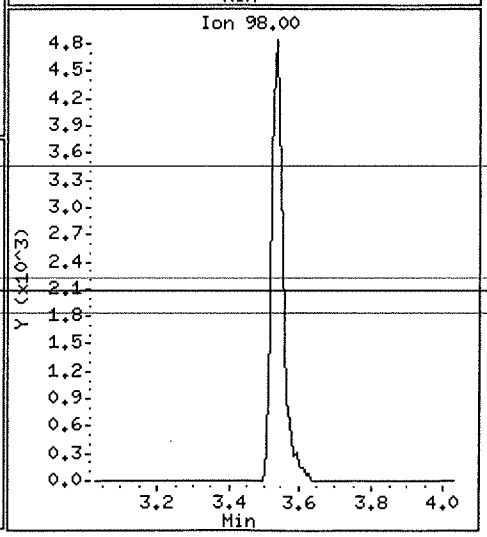












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D

Date : 24-SEP-2019 20:47

Client ID: HS19090860-05

Instrument: voa6.i

Sample Info: HS19090860-05;HS19090860-05;;;

Purge Volume: 5.0

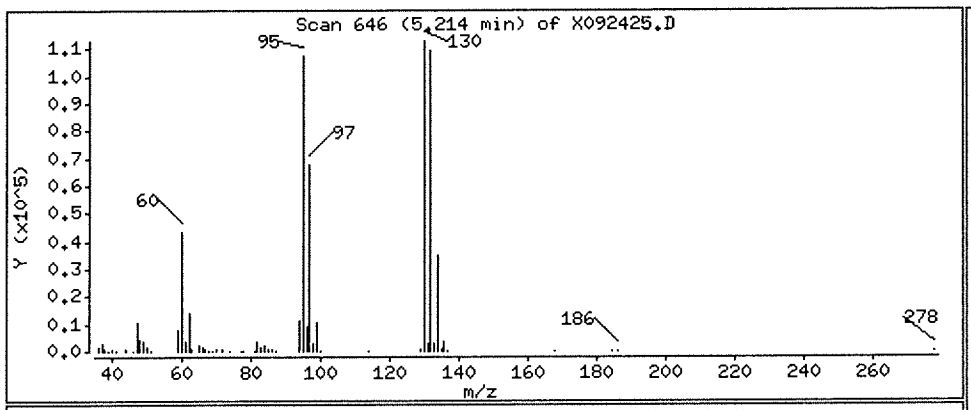
Operator: PC

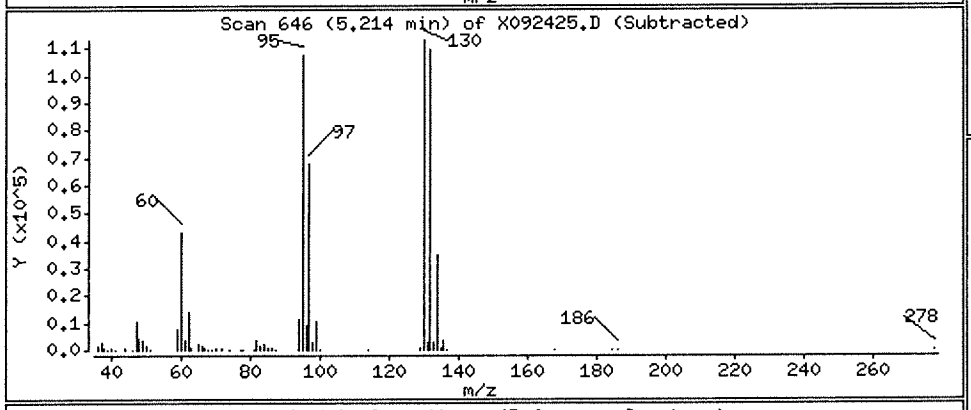
Column phase: DB624

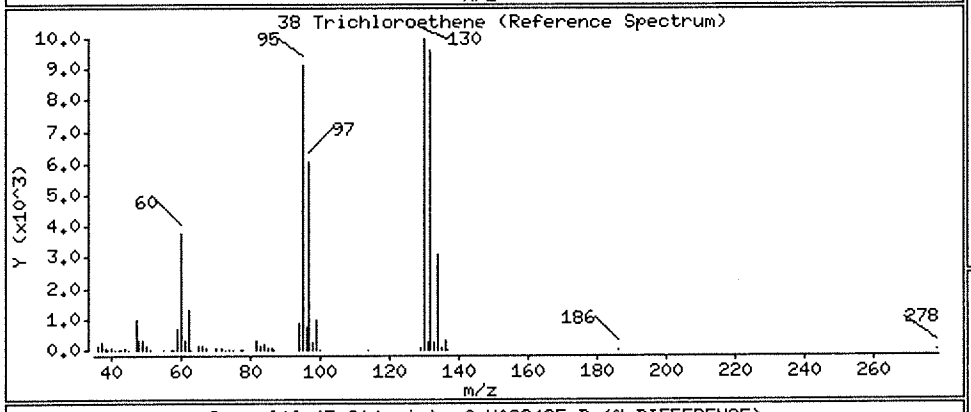
Column diameter: 0.18

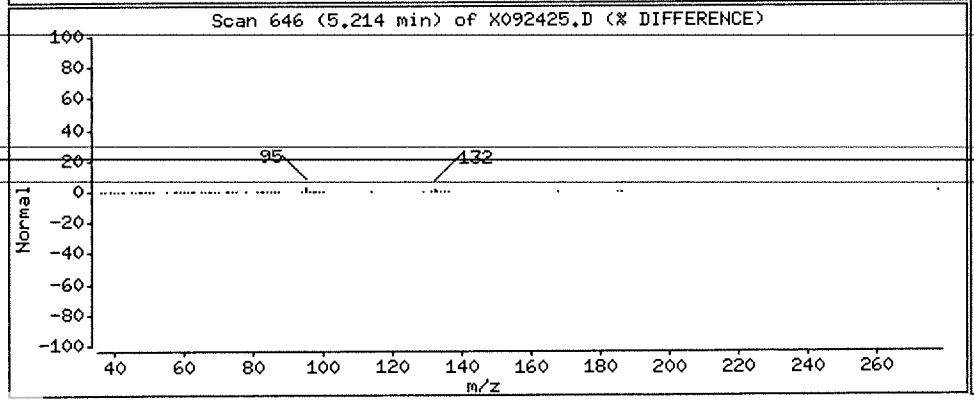
38 Trichloroethene

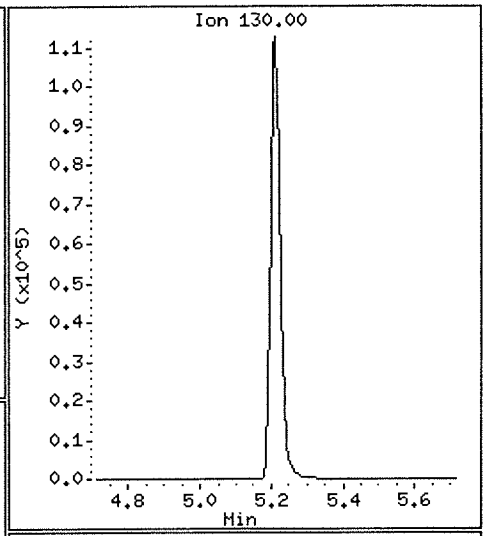
Concentration: 34.24 ug/l

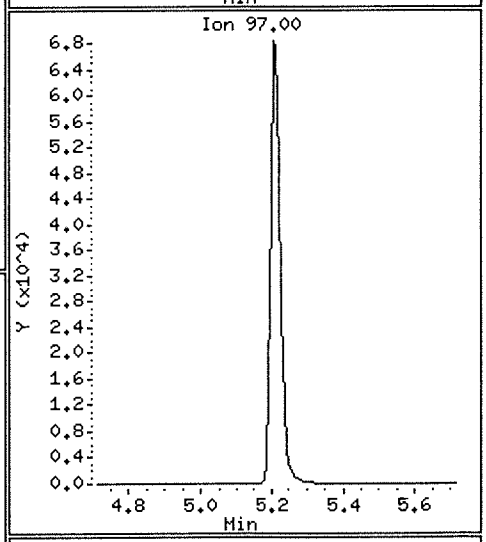


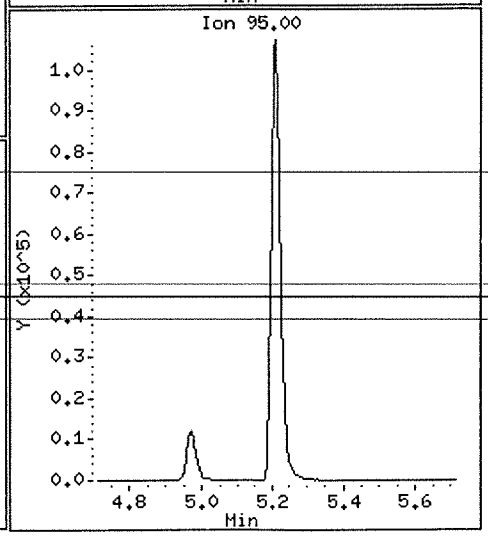












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092425.D

Date : 24-SEP-2019 20:47

Client ID: HS19090860-05

Instrument: voa6.i

Sample Info: HS19090860-05;HS19090860-05;;;

Purge Volume: 5.0

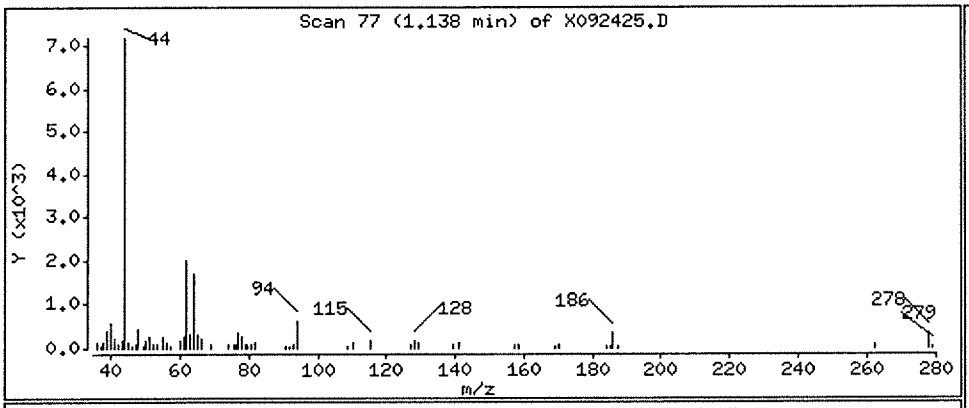
Operator: PC

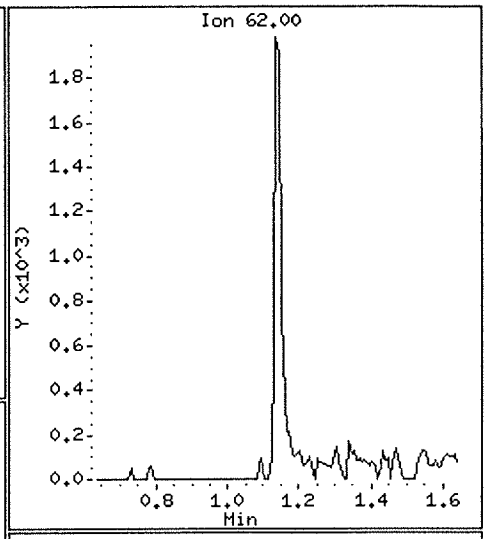
Column phase: DB624

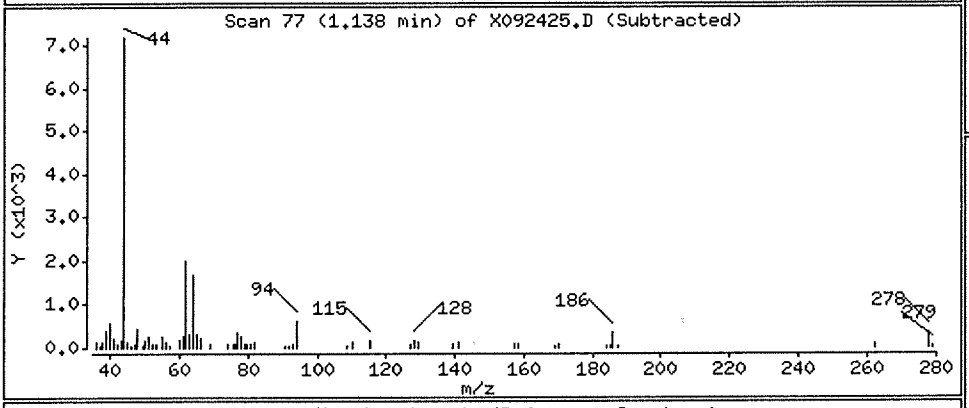
Column diameter: 0.18

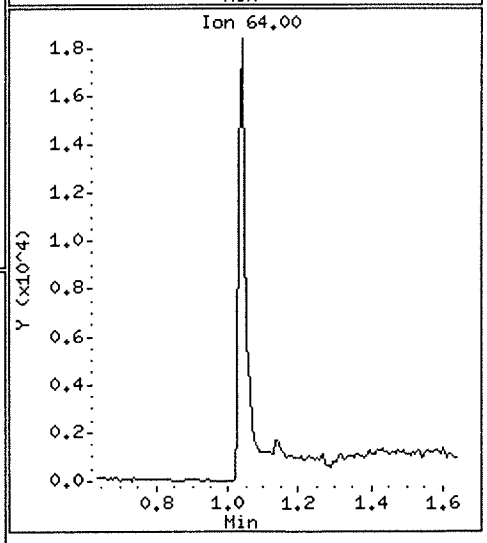
5 Vinyl Chloride

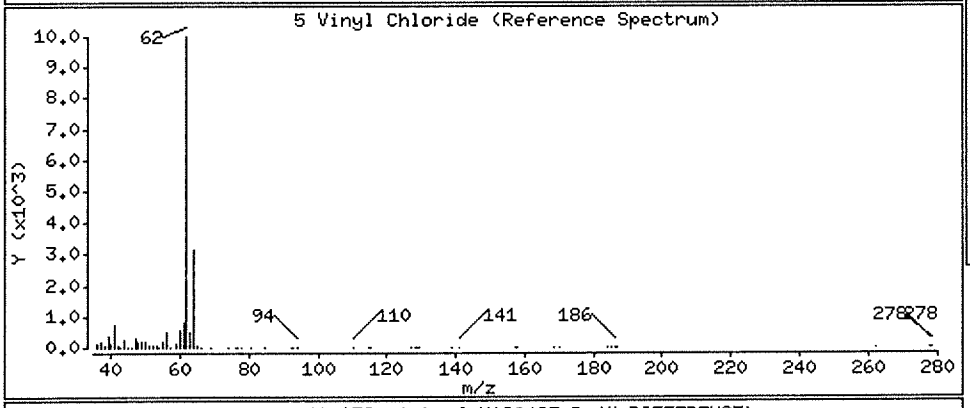
Concentration: 0.43 ug/l

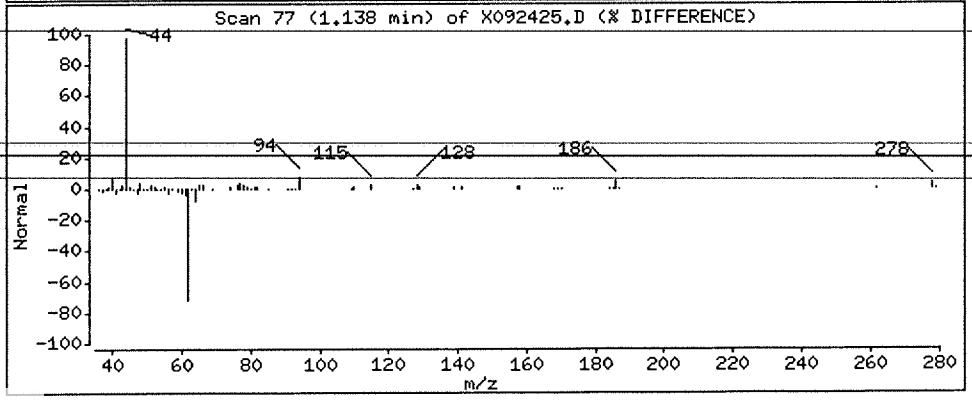












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D
Lab Smp Id: HS19090860-08 Client Smp ID: HS19090860-08
Inj Date : 24-SEP-2019 21:11
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-08;HS19090860-08;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 26
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

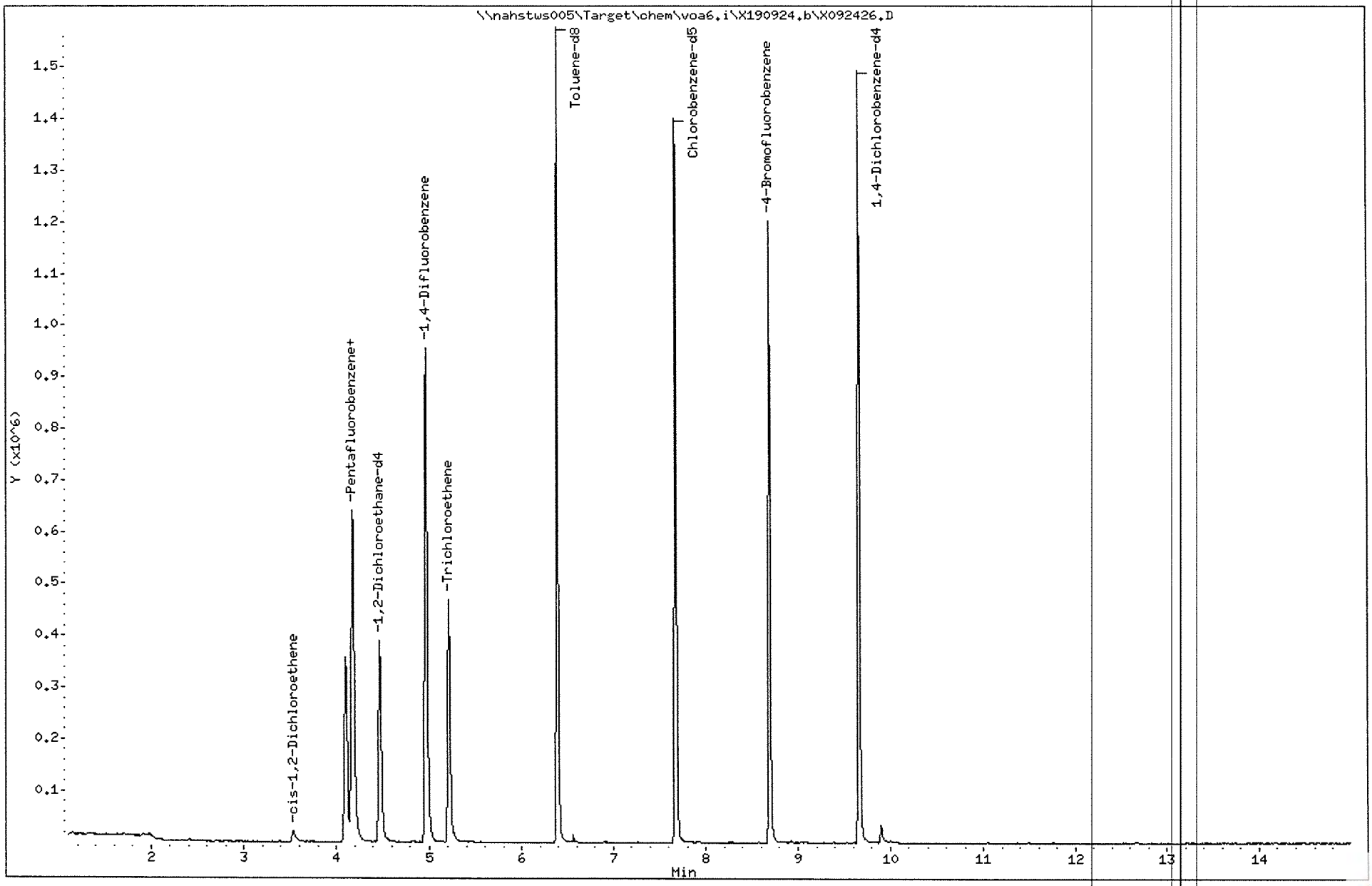
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.538	3.530	(0.846)	11559	1.71749	1.71(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	167005	26.9242	26.92
5 Vinyl Chloride	62	1.138	1.138	(0.272)	2799	0.40560	0.40(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	286140	46.0730	46.07
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	346948	53.0499	53.04
$ 30 Dibromofluoromethane	113	4.104	4.103	(0.981)	253183	47.5275	47.52
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	949188	49.2231	49.22
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	545164	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	809207	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	686270	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	359783	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D
Date : 24-SEP-2019 21:11
Client ID: HS19090860-08
Sample Info: HS19090860-08;HS19090860-08;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D

Date : 24-SEP-2019 21:11

Client ID: HS19090860-08

Instrument: voa6.i

Sample Info: HS19090860-08;HS19090860-08;;;

Purge Volume: 5.0

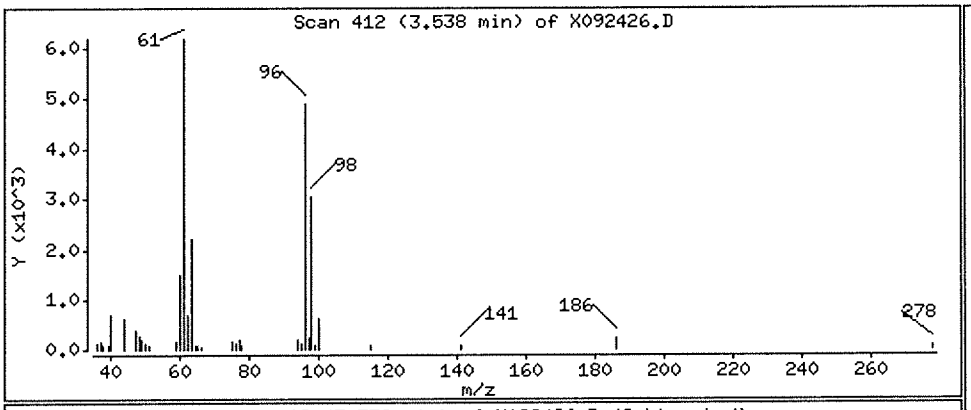
Operator: PC

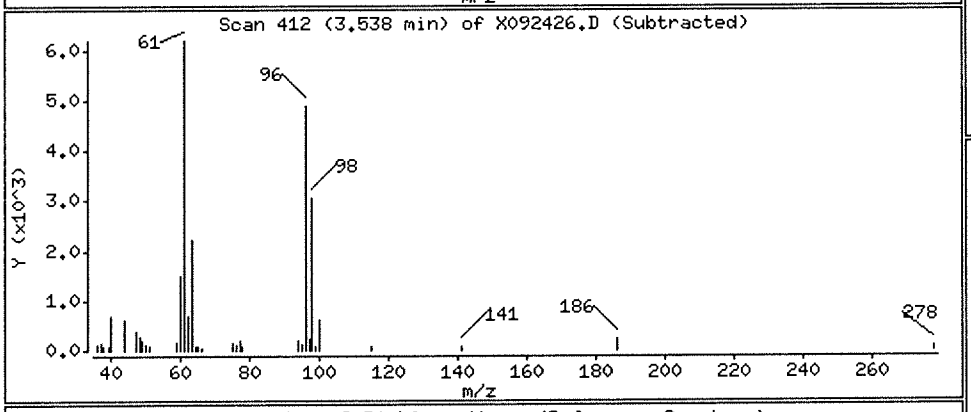
Column phase: DB624

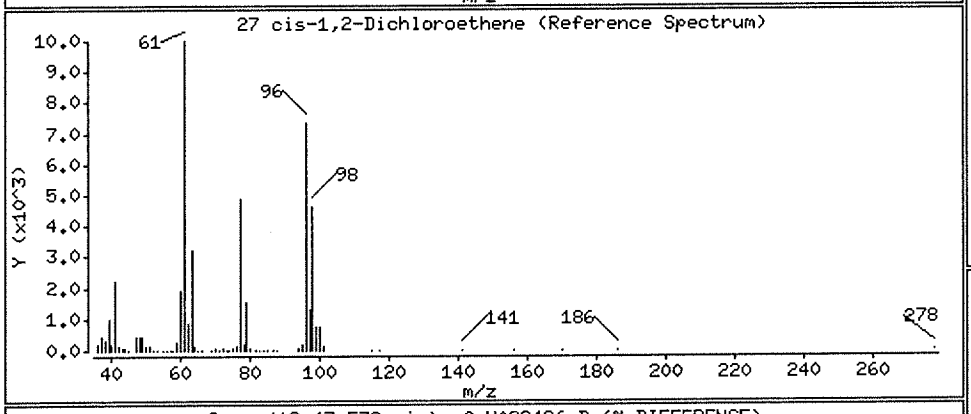
Column diameter: 0.18

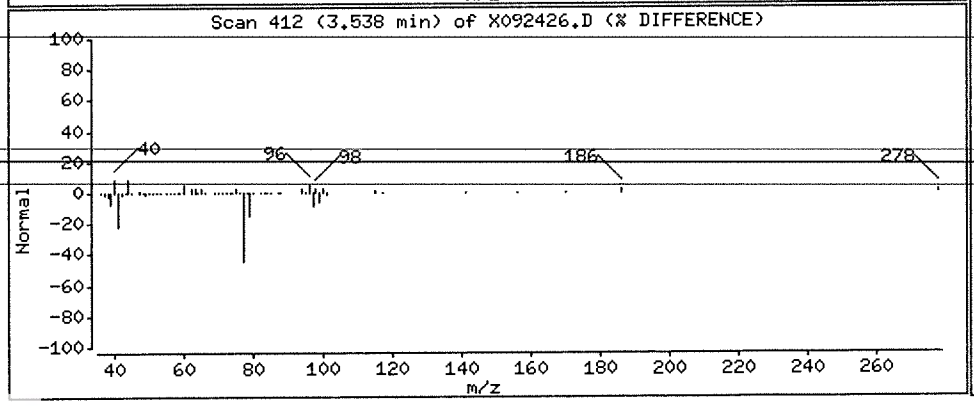
27 cis-1,2-Dichloroethene

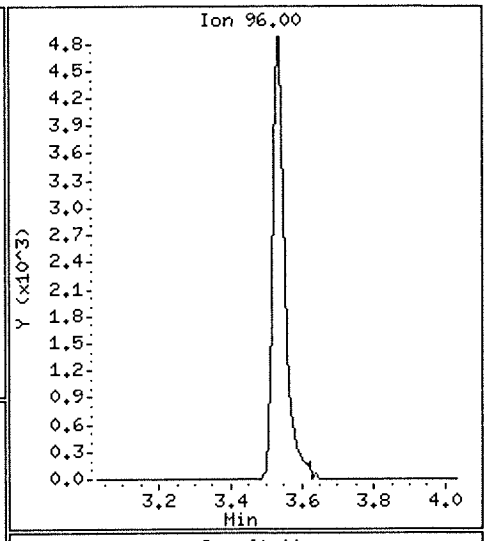
Concentration: 1.71 ug/l

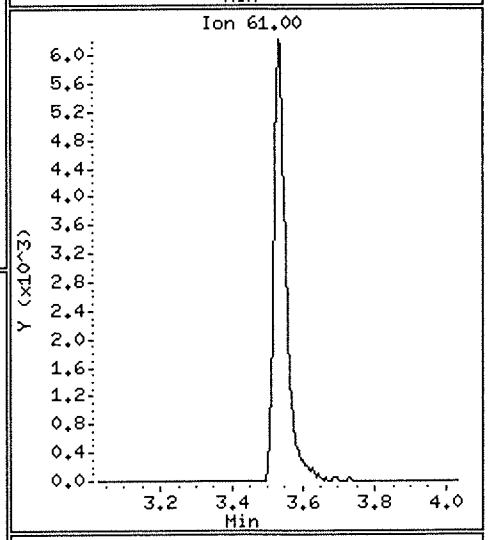


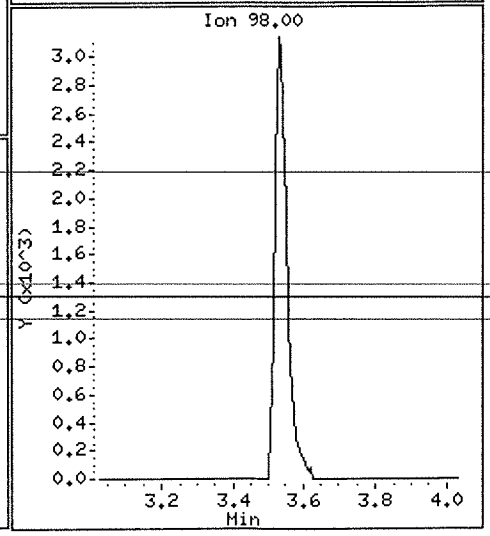












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D

Date : 24-SEP-2019 21:11

Client ID: HS19090860-08

Instrument: voa6.i

Sample Info: HS19090860-08;HS19090860-08;;;

Purge Volume: 5.0

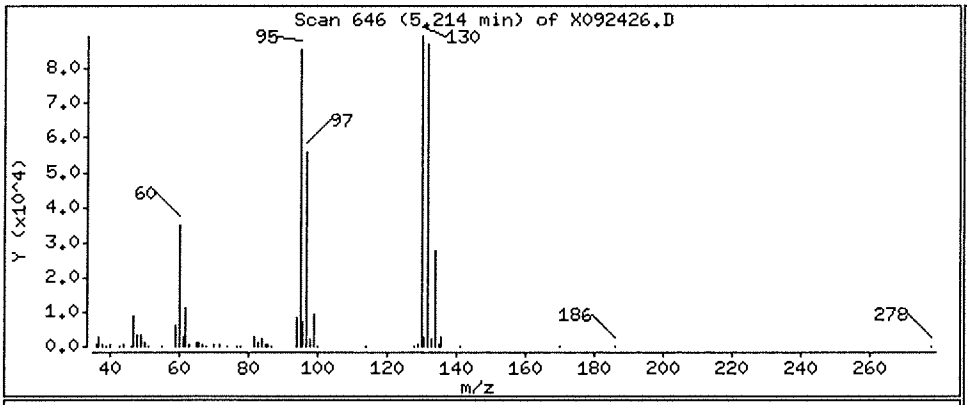
Operator: PC

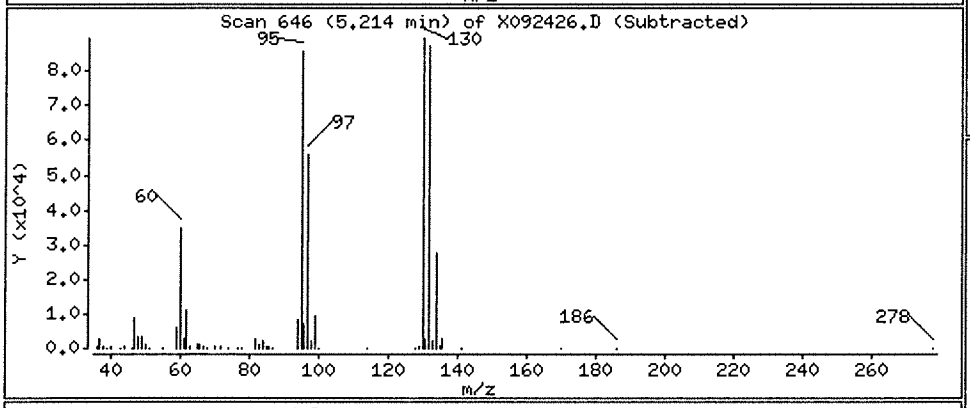
Column phase: DB624

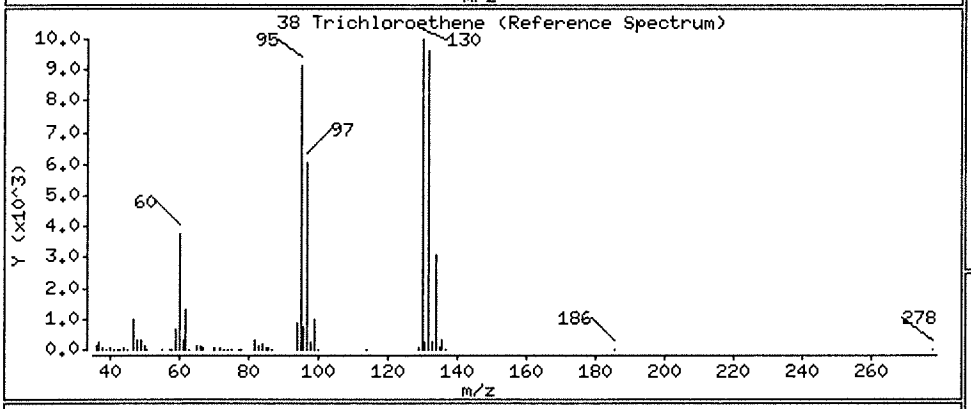
Column diameter: 0.18

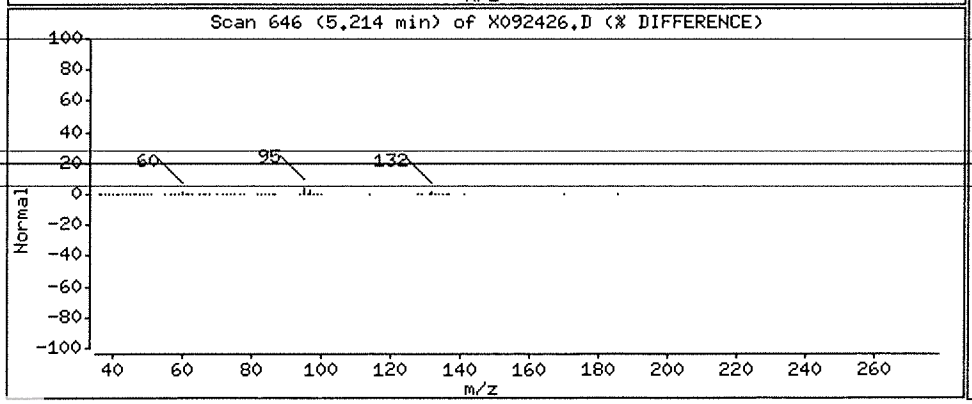
38 Trichloroethene

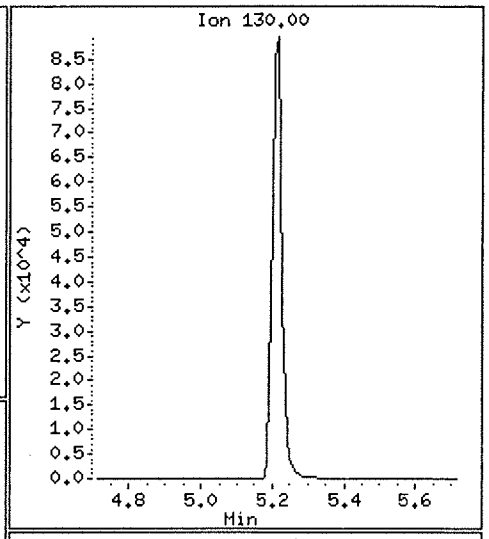
Concentration: 26.92 ug/l

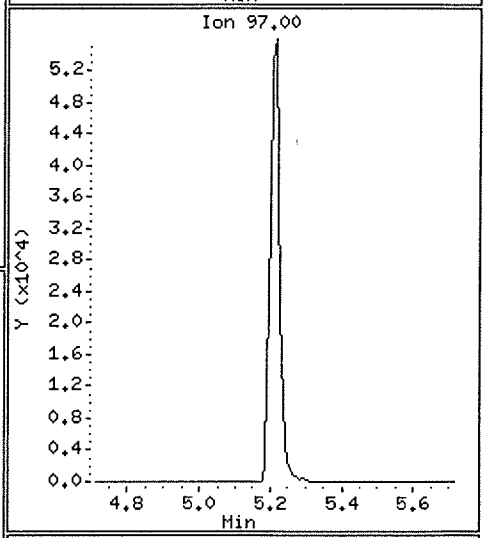


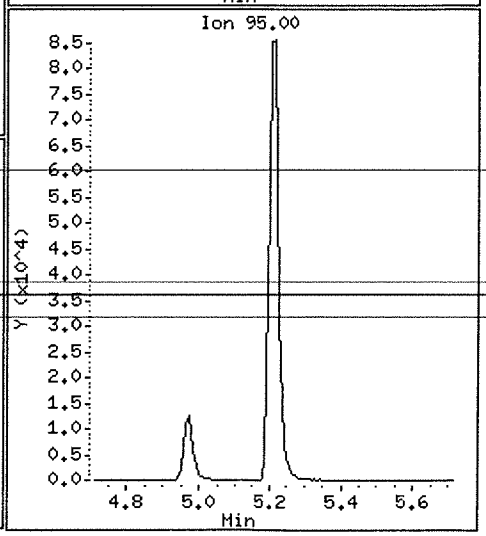












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092426.D

Date : 24-SEP-2019 21:11

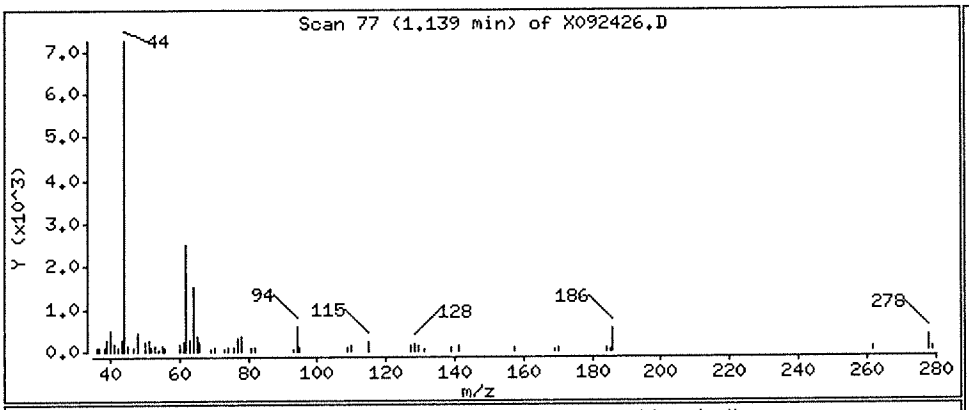
Client ID: HS19090860-08 Instrument: voa6.i

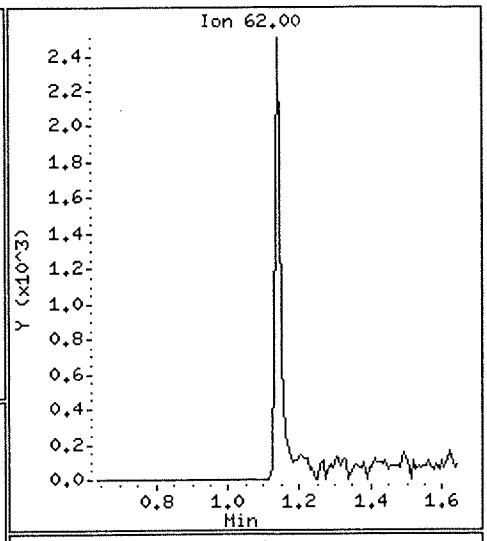
Sample Info: HS19090860-08;HS19090860-08;;;

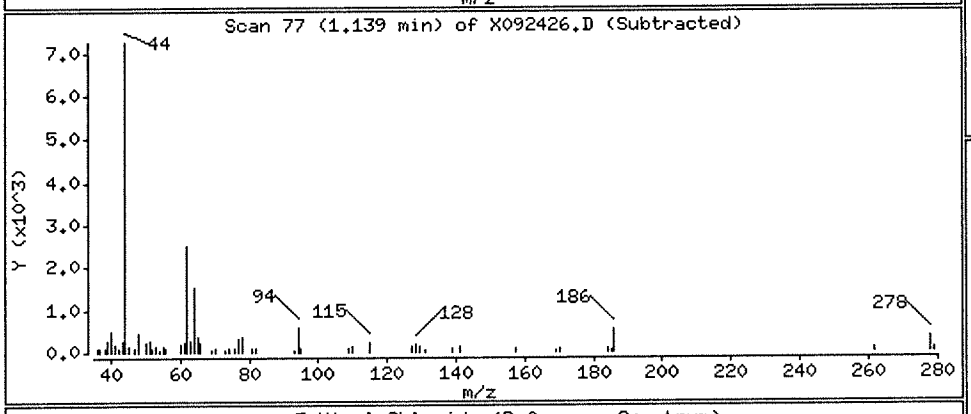
Purge Volume: 5.0 Operator: PC

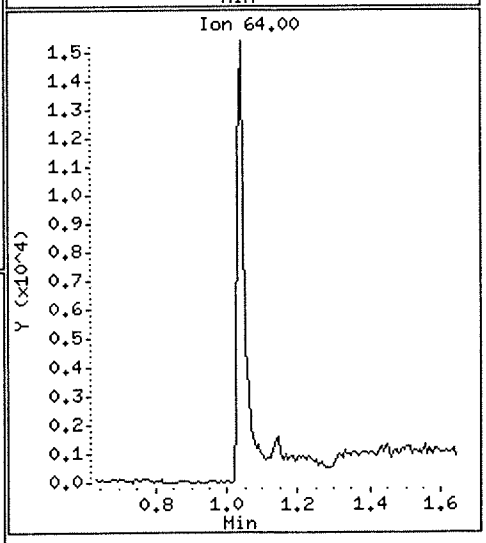
Column phase: DB624 Column diameter: 0.18

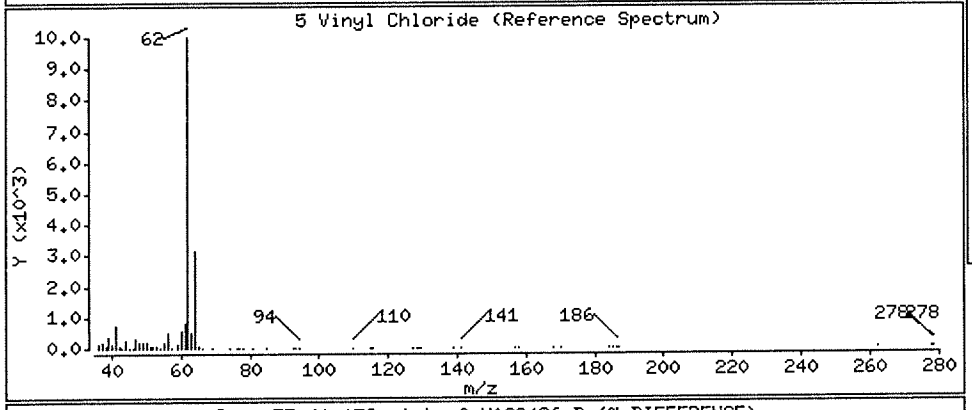
5 Vinyl Chloride Concentration: 0.40 ug/l

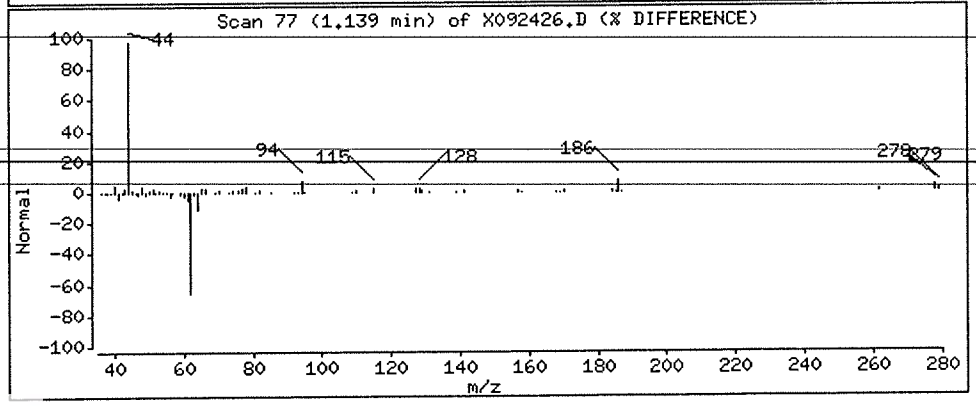












Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092427.D Page 1
Report Date: 09-Oct-2019 18:44

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092427.D
Lab Smp Id: HS19090860-11 Client Smp ID: HS19090860-11
Inj Date : 24-SEP-2019 21:36
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-11;HS19090860-11;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 27
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

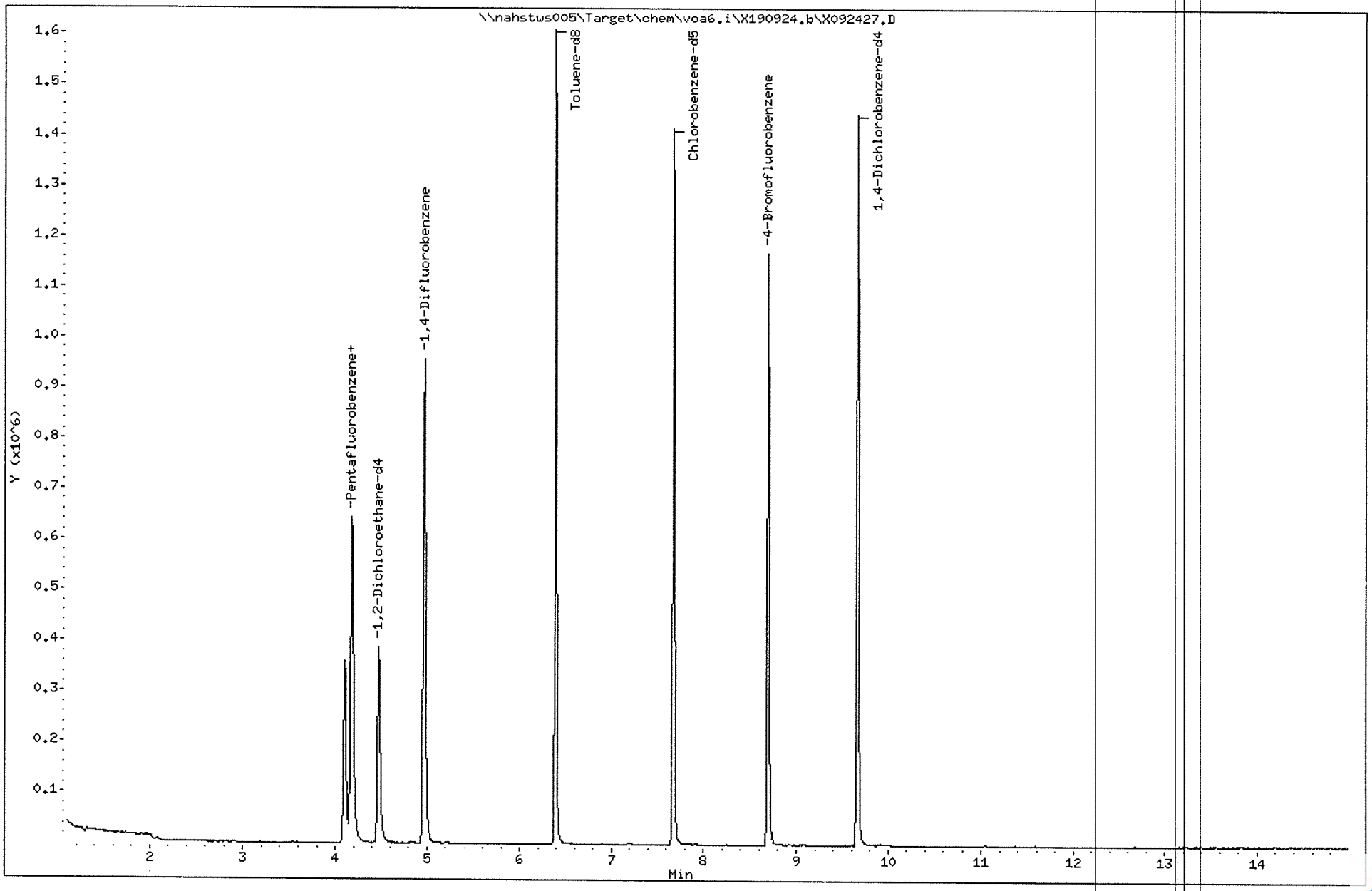
Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	284525	45.5840	45.58
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	336784	51.6252	51.62
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	252495	47.1655	47.16
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	954238	49.6396	49.63
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	547780	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	804775	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	684132	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	350093	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092427.D
Date : 24-SEP-2019 21:36
Client ID: HS19090860-11
Sample Info: HS19090860-11;HS19090860-11;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092428.D Page 1
Report Date: 09-Oct-2019 18:44

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Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092428.D
Lab Smp Id: HS19090860-12 Client Smp ID: HS19090860-12
Inj Date : 24-SEP-2019 22:00
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-12;HS19090860-12;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 28
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

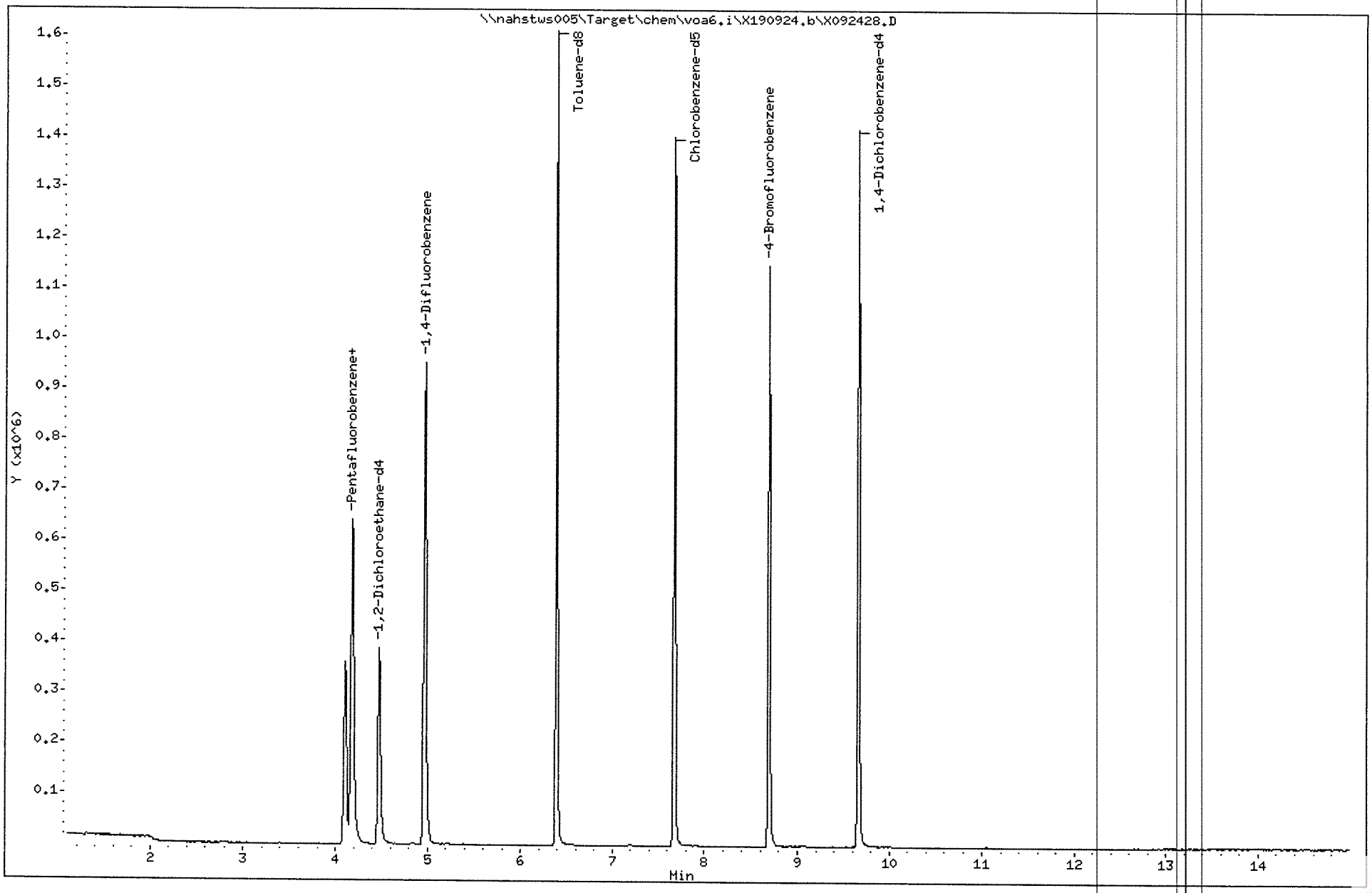
Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	285194	45.7322	45.73
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	338153	51.8492	51.84
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	252570	47.2197	47.21
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	944809	49.1577	49.15
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	547325	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	806567	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	684013	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	337681	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092428.D
Date : 24-SEP-2019 22:00
Client ID: HS19090860-12
Sample Info: HS19090860-12;HS19090860-12;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



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Data file : \\nahstws005\Target\chem\voa6.i\X190924.b\X092429.D
Lab Smp Id: CCV-END Client Smp ID: CCV-END
Inj Date : 24-SEP-2019 22:24
Operator : PC Inst ID: voa6.i
Smp Info : CCV-END;CCV-END;2;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190924.b\8260W.m
Meth Date : 09-Oct-2019 18:43 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 29 Continuing Calibration Sample
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

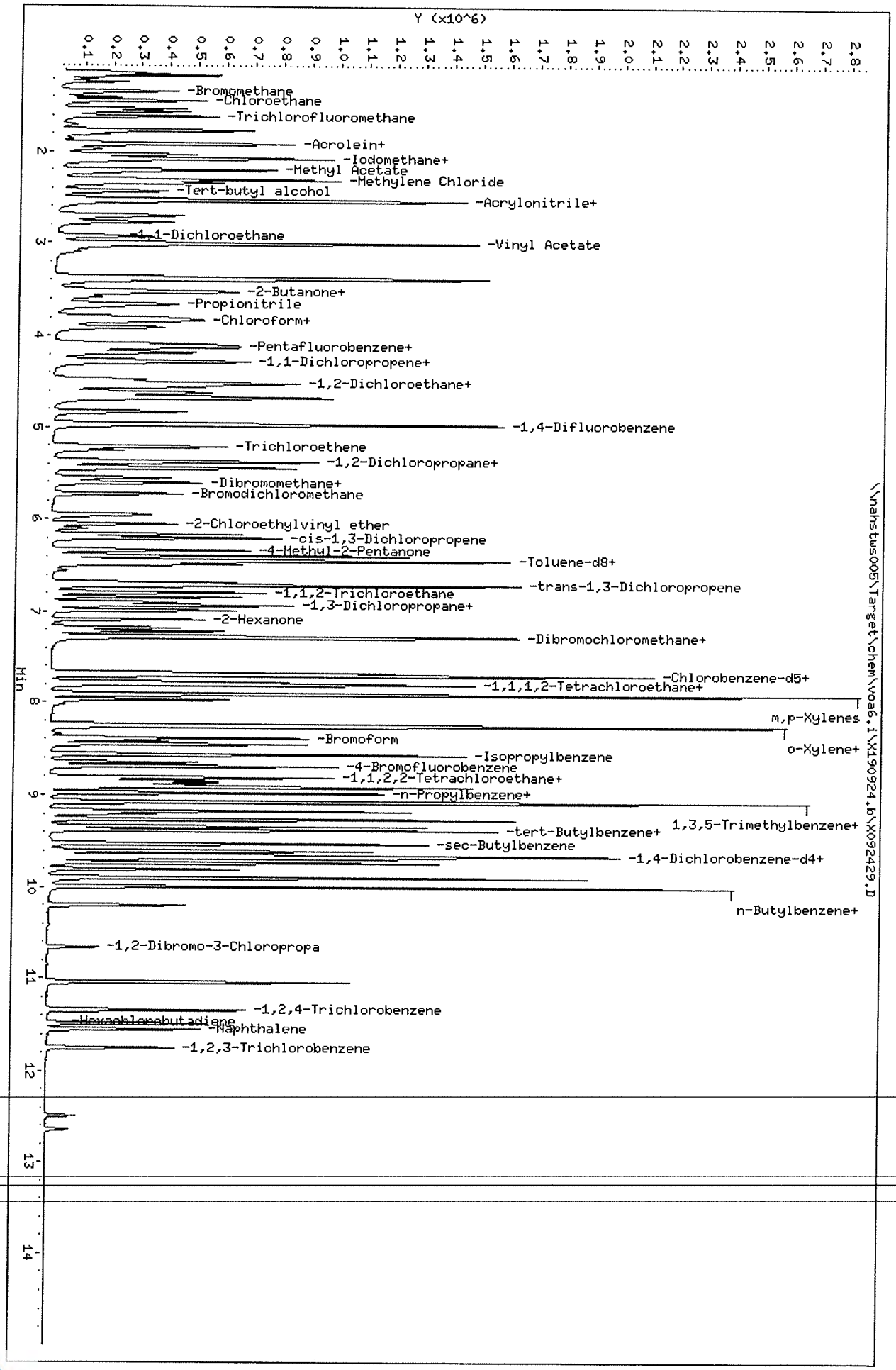
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	159358	50.0000	48.55
11 1,1-Dichloroethene	96	1.919	1.911	(0.459)	163138	50.0000	46.02
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	261958	50.0000	44.83
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	225657	50.0000	44.65
17 Methylene Chloride	84	2.306	2.305	(0.551)	216668	50.0000	49.07
38 Trichloroethene	130	5.214	5.214	(1.049)	211978	50.0000	44.07
5 Vinyl Chloride	62	1.138	1.138	(0.272)	240687	50.0000	46.44
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	230078	50.0000	49.40
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	279779	50.0000	51.32
$ 30 Dibromofluoromethane	113	4.104	4.103	(0.981)	200366	50.0000	50.13
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	736791	50.0000	45.87
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	409343	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	627425	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.678	(1.000)	571603	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	291842	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190924.b\X092429.D
Date : 24-SEP-2019 22:24
Client ID: CCV-END
Sample Info: CCV-END;CCV-END;2;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



MSVOA06 -Logbook

Batch: 37648
Date: 09-25-2019
Method: 8260
Comments:

Analyst: Devak Giga
Reviewer:
Laboratory: Houston

#	Samp ID	Type	Analyzed	DF	Init Wt/Vol	Final Vol	File ID	Matrix	Status	pH
1	BFB	TUNE	09-25-2019 10:13 am	1.00	0.00 mL	0.00 mL	X092501.D	Liquid	Y	NA
	Auto find/purged									
2	CCV	CCV	09-25-2019 10:37 am	1.00	5.00 mL	0.00 mL	X092502.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									
3	CCV	CCV	09-25-2019 11:01 am	1.00	5.00 mL	0.00 mL	X092503.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									
4	CCB	SAMP	09-25-2019 11:25 am	1.00	5.00 mL	0.00 mL	X092504.D	Liquid	Y	NA
	CCB									
5	VLCSW-190925	LCS	09-25-2019 11:49 am	1.00	5.00 mL	0.00 mL	X092505.D	Liquid	Y	NA
	4 uL LCS std/50 mL DI									
6	BLK	SAMP	09-25-2019 12:13 pm	1.00	5.00 mL	0.00 mL	X092506.D	Liquid	Y	NA
	Cleanup blk									
7	VBLKW-190925	MBLK	09-25-2019 12:37 pm	1.00	5.00 mL	0.00 mL	X092507.D	Liquid	Y	NA
8	HS19090847-02	SAMP	09-25-2019 01:01 pm	1.00	5.00 mL	0.00 mL	X092508.D	Liquid	Y	<2
9	HS19090847-01	SAMP	09-25-2019 01:25 pm	1.00	5.00 mL	0.00 mL	X092509.D	Liquid	Y	<2
10	HS19090860-15	SAMP	09-25-2019 01:49 pm	1.00	5.00 mL	0.00 mL	X092510.D	Liquid	Y	<2
11	HS19090860-16	SAMP	09-25-2019 02:13 pm	1.00	5.00 mL	0.00 mL	X092511.D	Liquid	Y	<2
12	HS19090860-04	SAMP	09-25-2019 02:37 pm	1.00	5.00 mL	0.00 mL	X092512.D	Liquid	Y	<2
13	HS19090860-03	SAMP	09-25-2019 03:02 pm	25.00	5.00 mL	0.00 mL	X092513.D	Liquid	Y	<2
14	HS19090847-01MS	MS	09-25-2019 03:26 pm	1.00	5.00 mL	0.00 mL	X092514.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
15	HS19090847-01MSD	MSD	09-25-2019 03:50 pm	1.00	5.00 mL	0.00 mL	X092515.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
16	HS19090860-03	SAMP	09-25-2019 04:14 pm	250.0(	5.00 mL	0.00 mL	X092516.D	Liquid	Y	<2
17	HS19090860-04	SAMP	09-25-2019 04:38 pm	5.00	5.00 mL	0.00 mL	X092517.D	Liquid	Y	<2
18	HS19090860-13	SAMP	09-25-2019 05:02 pm	1.00	5.00 mL	0.00 mL	X092518.D	Liquid	Y	<2
19	HS19090860-14	SAMP	09-25-2019 05:26 pm	1.00	5.00 mL	0.00 mL	X092519.D	Liquid	Y	<2
20	HS19090962-01	SAMP	09-25-2019 05:50 pm	1.00	5.00 mL	0.00 mL	X092520.D	Liquid	Y	<2
21	HS19091157-07	SAMP	09-25-2019 06:14 pm	1.00	5.00 mL	0.00 mL	X092521.D	Liquid	Y	<2
22	HS19090860-09	SAMP	09-25-2019 06:38 pm	5.00	5.00 mL	0.00 mL	X092522.D	Liquid	Y	<2
23	HS19090860-09	SAMP	09-25-2019 07:02 pm	25.00	5.00 mL	0.00 mL	X092523.D	Liquid	Y	<2
24	HS19090860-06	SAMP	09-25-2019 07:26 pm	10.00	5.00 mL	0.00 mL	X092524.D	Liquid	Y	<2
25	HS19090860-06	SAMP	09-25-2019 07:50 pm	100.0(	5.00 mL	0.00 mL	X092525.D	Liquid	Y	<2
26	HS19090860-07	SAMP	09-25-2019 08:14 pm	10.00	5.00 mL	0.00 mL	X092526.D	Liquid	Y	<2
27	HS19090860-07	SAMP	09-25-2019 08:38 pm	100.0(	5.00 mL	0.00 mL	X092527.D	Liquid	Y	<2
28	HS19090860-10	SAMP	09-25-2019 09:02 pm	10.00	5.00 mL	0.00 mL	X092528.D	Liquid	Y	<2
29	HS19090860-10	SAMP	09-25-2019 09:26 pm	100.0(	5.00 mL	0.00 mL	X092529.D	Liquid	Y	<2
30	CCV-END	CCV	09-25-2019 09:50 pm	1.00	5.00 mL	0.00 mL	X092530.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									

MSVOA06 -Logbook

Chemical	Value
SURR SPK ID	30502-94-03
IS ID	30502-94-04
ICV STD ID	30603-84-01
LCS/MS ID	30603-84-01
CAL STD ID	30502-94-01/02
BFB ID	30502-94-03
pH Paper	634-64-11

FORM 2
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

	CLIENT SAMPLE NO.	SMC1 (TOL) #	SMC2 #	SMC3 (DCE) #	OTHER #	TOT OUT
01	VLCSW-190925	95	107	103	104	0
02	VBLKW-190925	101	103	89	93	0
03	HS19090860-1	100	104	92	95	0
04	HS19090860-1	99	104	90	93	0
05	HS19090860-0	99	105	91	94	0
06	HS19090860-0	97	106	92	94	0
07	HS19090847-0	98	101	91	94	0
08	HS19090847-0	98	104	90	94	0
09	HS19090860-0	99	104	91	94	0
10	HS19090860-0	98	108	91	94	0
11	HS19090860-1	99	102	91	93	0
12	HS19090860-1	100	105	91	93	0
13	HS19090860-0	99	104	90	93	0
14	HS19090860-0	98	104	89	93	0
15	HS19090860-0	99	105	90	93	0
16	HS19090860-0	98	105	90	94	0
17	HS19090860-0	99	102	89	92	0
18	HS19090860-0	97	107	89	93	0
19	HS19090860-1	100	104	90	93	0
20	HS19090860-1	98	104	89	93	0
21						
22						
23						
24						
25						
26						
27						
28						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(70-130)
SMC2	= 4-Bromofluorobenzene	(70-130)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(70-130)
OTHER	= Dibromofluoromethane	(70-130)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4
VOLATILE METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

VBLKW-190925

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092507 Lab Sample ID: VBLKW-190925

Date Analyzed: 09/25/19 Time Analyzed: 1237

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: VOA6

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCSW-190925	VLCSW-190925	X092505	1149
02	HS19090860-1	HS19090860-15	X092510	1349
03	HS19090860-1	HS19090860-16	X092511	1413
04	HS19090860-0	HS19090860-04	X092512	1437
05	HS19090860-0	HS19090860-03	X092513	1502
06	HS19090847-0	HS19090847-01M	X092514	1526
07	HS19090847-0	HS19090847-01M	X092515	1550
08	HS19090860-0	HS19090860-03	X092516	1614
09	HS19090860-0	HS19090860-04	X092517	1638
10	HS19090860-1	HS19090860-13	X092518	1702
11	HS19090860-1	HS19090860-14	X092519	1726
12	HS19090860-0	HS19090860-09	X092522	1838
13	HS19090860-0	HS19090860-09	X092523	1902
14	HS19090860-0	HS19090860-06	X092524	1926
15	HS19090860-0	HS19090860-06	X092525	1950
16	HS19090860-0	HS19090860-07	X092526	2014
17	HS19090860-0	HS19090860-07	X092527	2038
18	HS19090860-1	HS19090860-10	X092528	2102
19	HS19090860-1	HS19090860-10	X092529	2126
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

FORM 5
VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092501 BFB Injection Date: 09/25/19

Instrument ID: VOA6 BFB Injection Time: 1013

GC Column: DB624 ID: 0.25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	16.9
75	30.0 - 60.0% of mass 95	47.0
95	Base Peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.1
173	Less than 2.0% of mass 174	0.6 (0.8)1
174	Greater than 50.0% of mass 95	76.7
175	5.0 - 9.0% of mass 174	5.8 (7.6)1
176	95.0 - 101.0% of mass 174	73.6 (96.0)1
177	5.0 - 9.0% of mass 176	5.0 (6.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	CCV	CCV	X092503	09/25/19	1101
02	VLCSW-190925	VLCSW-190925	X092505	09/25/19	1149
03	VBLKW-190925	VBLKW-190925	X092507	09/25/19	1237
04	HS19090860-1	HS19090860-15	X092510	09/25/19	1349
05	HS19090860-1	HS19090860-16	X092511	09/25/19	1413
06	HS19090860-0	HS19090860-04	X092512	09/25/19	1437
07	HS19090860-0	HS19090860-03	X092513	09/25/19	1502
08	HS19090847-0	HS19090847-01M	X092514	09/25/19	1526
09	HS19090847-0	HS19090847-01M	X092515	09/25/19	1550
10	HS19090860-0	HS19090860-03	X092516	09/25/19	1614
11	HS19090860-0	HS19090860-04	X092517	09/25/19	1638
12	HS19090860-1	HS19090860-13	X092518	09/25/19	1702
13	HS19090860-1	HS19090860-14	X092519	09/25/19	1726
14	HS19090860-0	HS19090860-09	X092522	09/25/19	1838
15	HS19090860-0	HS19090860-09	X092523	09/25/19	1902
16	HS19090860-0	HS19090860-06	X092524	09/25/19	1926
17	HS19090860-0	HS19090860-06	X092525	09/25/19	1950
18	HS19090860-0	HS19090860-07	X092526	09/25/19	2014
19	HS19090860-0	HS19090860-07	X092527	09/25/19	2038
20	HS19090860-1	HS19090860-10	X092528	09/25/19	2102
21	HS19090860-1	HS19090860-10	X092529	09/25/19	2126
22	CCV-END	CCV-END	X092530	09/25/19	2150

FORM V VOA

FORM 7B
VOLATILE CALIBRATION VERIFICATION SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date: 09/25/19 Time: 1101

Lab File ID: X092503 Init. Calib. Date(s): 09/24/19 09/24/19

Init. Calib. Times: 1112 1511

GC Column: DB624 ID: 0.18 (mm)

COMPOUND	RRF or AMOUNT	RRF50.000 or AMOUNT	CCAL RRF50.000	MIN RRF	%D or %DRIFT	MAX %D or %DRIFT	CURV TYPE
1,2-Dichloroethane	0.4650000	0.4160431	0.4160431	0.1	10.53	20.00	AVRG
Vinyl Chloride	0.6330000	0.6100188	0.6100188	0.1	3.63	20.00	AVRG
1,1,2-Trichloroethane	49.835434	50.000000	0.2892675	0.1	0.33	20.00	LINR
Methylene Chloride	47.625148	50.000000	0.5453657	0.1	4.75	20.00	LINR
1,1-Dichloroethene	0.4330000	0.4146009	0.4146009	0.1	4.25	20.00	AVRG
Trichloroethene	0.3830000	0.3509932	0.3509932	0.2	8.36	20.00	AVRG
Toluene-d8	1.4050000	1.3165704	1.3165704	0.1	6.29	20.00	AVRG
4-Bromofluorobenzene	51.945333	50.000000	0.4970046	0.1	-3.89	20.00	LINR
1,2-Dichloroethane-d4	49.361831	50.000000	0.5747734	0.1	1.28	20.00	LINR
Dibromofluoromethane	50.218986	50.000000	0.5009222	0.1	-0.44	20.00	LINR

FORM 7B
VOLATILE CALIBRATION VERIFICATION SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date: 09/25/19 Time: 2150

Lab File ID: X092530 Init. Calib. Date(s): 09/24/19 09/24/19

Init. Calib. Times: 1112 1511

GC Column: DB624 ID: 0.18 (mm)

COMPOUND	RRF or AMOUNT	RRF50.000 or AMOUNT	CCAL RRF50.000	MIN RRF	%D or %DRIFT	MAX %D or %DRIFT	CURV TYPE
1,2-Dichloroethane	0.4650000	0.4160431	0.4160431	0.1	10.53	50.00	AVRG
Vinyl Chloride	0.6330000	0.6100188	0.6100188	0.1	3.63	50.00	AVRG
1,1,2-Trichloroethane	50.419315	50.000000	0.2892675	0.1	-0.84	50.00	LINR
Methylene Chloride	50.620337	50.000000	0.5453657	0.1	-1.24	50.00	LINR
1,1-Dichloroethene	0.4330000	0.4146009	0.4146009	0.1	4.25	50.00	AVRG
Trichloroethene	0.3830000	0.3509932	0.3509932	0.2	8.36	50.00	AVRG
Toluene-d8	1.4050000	1.3165704	1.3165704	0.1	6.29	50.00	AVRG
4-Bromofluorobenzene	52.132273	50.000000	0.4970046	0.1	-4.26	50.00	LINR
1,2-Dichloroethane-d4	50.546779	50.000000	0.5747734	0.1	-1.09	50.00	LINR
Dibromofluoromethane	51.330803	50.000000	0.5009222	0.1	-2.66	50.00	LINR

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092503 Date Analyzed: 09/25/19

Instrument ID: VOA6 Time Analyzed: 1101

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS1(CBZ) AREA #	RT #	IS2(DCB) AREA #	RT #	IS3(DFB) AREA #	RT #
	12 HOUR STD	554193	7.67	288562	9.67	610397	4.97
	UPPER LIMIT	1108386	8.17	577124	10.17	1220794	5.47
	LOWER LIMIT	277097	7.17	144281	9.17	305199	4.47
	CLIENT SAMPLE NO.						
01	VLCSW-190925	567818	7.67	299106	9.67	628097	4.97
02	VBLKW-190925	661823	7.67	316092	9.67	789626	4.97
03	HS19090860-1	669745	7.67	343923	9.67	793526	4.97
04	HS19090860-1	694295	7.67	355507	9.67	811724	4.97
05	HS19090860-0	681722	7.67	350631	9.67	797235	4.97
06	HS19090860-0	664988	7.67	357165	9.67	778122	4.97
07	HS19090847-0	647416	7.67	322512	9.67	750742	4.97
08	HS19090847-0	655178	7.67	341655	9.67	750600	4.97
09	HS19090860-0	662410	7.67	325205	9.67	777250	4.97
10	HS19090860-0	693315	7.67	372297	9.67	803475	4.97
11	HS19090860-1	672511	7.67	344841	9.67	790174	4.97
12	HS19090860-1	682297	7.67	357046	9.67	810611	4.97
13	HS19090860-0	678467	7.67	347817	9.67	805973	4.97
14	HS19090860-0	721303	7.67	371703	9.67	843447	4.97
15	HS19090860-0	660519	7.67	351326	9.67	794182	4.97
16	HS19090860-0	683725	7.67	349817	9.67	797379	4.97
17	HS19090860-0	653886	7.67	309548	9.67	791287	4.97
18	HS19090860-0	702270	7.67	379587	9.67	809871	4.97
19	HS19090860-1	642749	7.67	323340	9.67	777814	4.97
20	HS19090860-1	680120	7.67	355062	9.67	795632	4.97

IS1 (CBZ) = Chlorobenzene-d5
IS2 (DCB) = 1,4-Dichlorobenzene-d4
IS3 (DFB) = 1,4-Difluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

FORM VIII VOA

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092503 Date Analyzed: 09/25/19

Instrument ID: VOA6 Time Analyzed: 1101

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS4 AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	404585	4.18				
	UPPER LIMIT	809170	4.68				
	LOWER LIMIT	202293	3.68				
	CLIENT SAMPLE NO.						
01	VLCSW-190925	408763	4.19				
02	VBLKW-190925	535673	4.18				
03	HS19090860-1	537387	4.19				
04	HS19090860-1	553472	4.18				
05	HS19090860-0	537656	4.19				
06	HS19090860-0	518098	4.19				
07	HS19090847-0	512863	4.18				
08	HS19090847-0	509006	4.18				
09	HS19090860-0	526245	4.18				
10	HS19090860-0	541943	4.18				
11	HS19090860-1	540449	4.19				
12	HS19090860-1	549831	4.18				
13	HS19090860-0	549505	4.18				
14	HS19090860-0	579346	4.18				
15	HS19090860-0	539384	4.18				
16	HS19090860-0	541423	4.18				
17	HS19090860-0	539995	4.18				
18	HS19090860-0	546818	4.19				
19	HS19090860-1	533258	4.19				
20	HS19090860-1	545462	4.18				

IS4 = Pentafluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

ata File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092501.D

Date : 25-SEP-2019 10:13

Client ID: BFB

Instrument: voa6.i

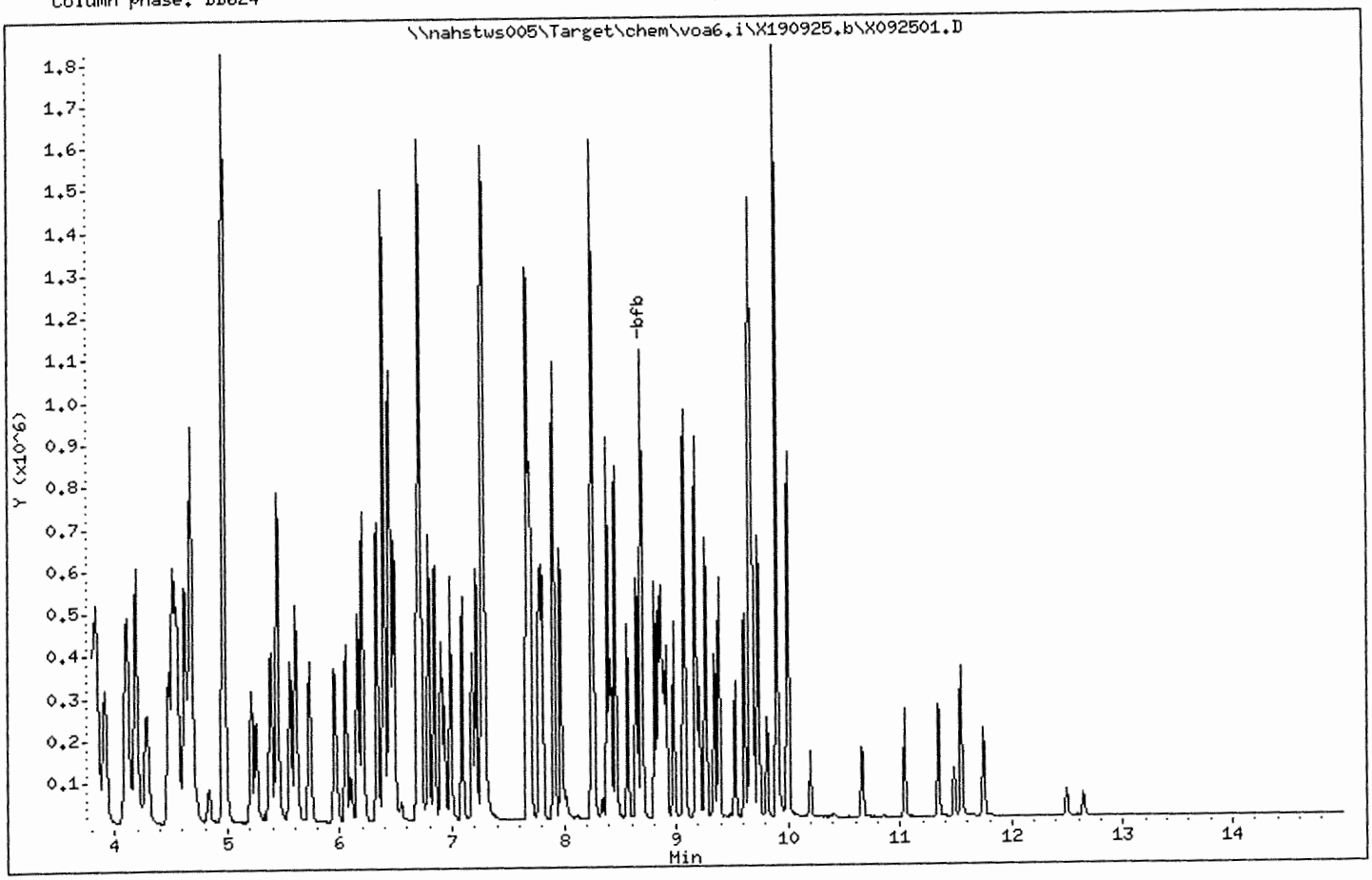
Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092501.D

Date : 25-SEP-2019 10:13

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

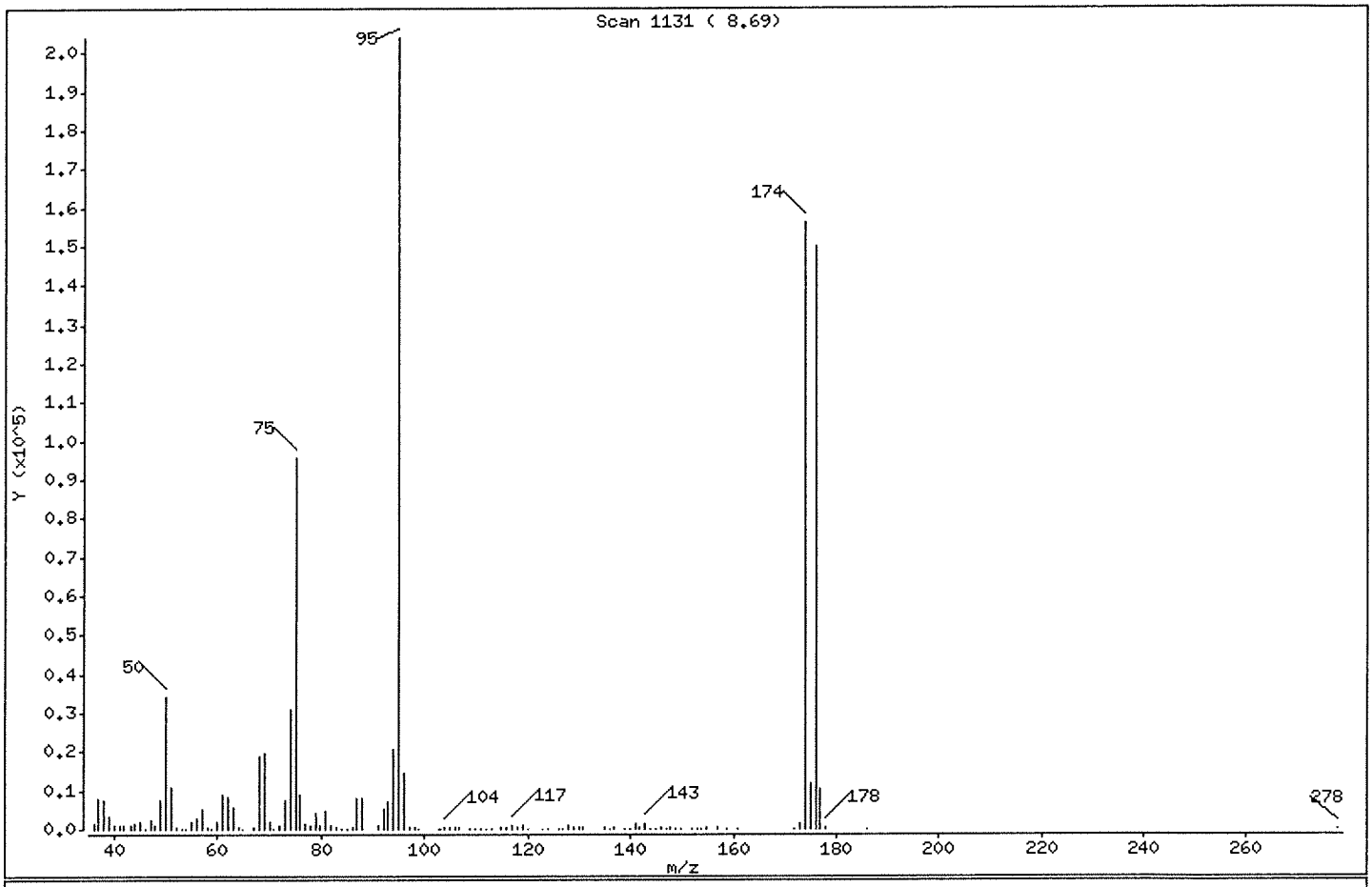
Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

1 bfb



m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
95	Base Peak, 100% relative abundance	100.00
50	15.00 - 40.00% of mass 95	16.88
75	30.00 - 60.00% of mass 95	46.95
96	5.00 - 9.00% of mass 95	7.07
173	Less than 2.00% of mass 174	0.59 (0.77)
174	Greater than 50.00% of mass 95	76.66
175	5.00 - 9.00% of mass 174	5.79 (7.56)
176	95.00 - 101.00% of mass 174	73.61 (96.03)
177	5.00 - 9.00% of mass 176	4.99 (6.77)

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092501.D

Date : 25-SEP-2019 10:13

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

Data File: X092501.D
Spectrum: Scan 1131 (8.69)
Location of Maximum: 95.00
Number of points: 117

m/z	Y	m/z	Y	m/z	Y	m/z	Y
36.10	1466	67.00	556	98.90	53	139.80	101
37.00	8013	68.00	18800	102.70	68	140.90	1378
38.10	7482	69.00	19744	103.10	67	141.80	324
39.10	3351	70.10	1706	103.90	650	142.90	1501
40.10	731	70.90	184	104.90	299	144.00	77
41.10	1059	72.00	986	105.80	645	144.90	147
42.00	949	73.00	7623	106.80	270	145.90	246
43.10	1080	74.00	30832	108.80	109	146.90	145
44.00	1496	75.00	95768	109.80	134	147.80	411
45.00	1781	76.00	8759	110.90	101	148.80	114
46.20	200	77.00	1502	111.90	111	149.90	217
47.00	2367	78.10	974	112.90	136	151.90	65
48.00	944	78.90	4325	114.80	308	152.90	160
49.00	7391	79.90	1143	115.90	569	153.80	100
50.00	34432	80.90	4500	116.90	1105	155.00	472
51.00	10698	82.00	1017	118.00	548	156.90	394
52.10	489	83.00	242	118.90	795	158.80	187
53.10	135	84.10	137	120.00	82	160.70	186
53.90	121	85.10	79	122.80	80	172.00	162
55.00	2020	86.00	265	123.90	115	173.00	1204
56.00	3004	87.00	7962	126.00	67	173.90	156352
57.00	5088	88.00	7948	126.80	200	175.00	11813
58.00	365	91.00	773	127.90	864	176.00	150144
58.90	164	92.00	5066	128.90	319	176.90	10169
60.00	1975	93.00	7161	130.00	556	177.90	305
61.00	8798	94.00	20624	130.70	277	185.90	172
62.00	8438	95.00	203968	134.90	258	278.20	108
63.00	5521	96.00	14427	136.00	67		
64.00	599	97.10	390	136.80	262		
65.00	107	98.00	516	138.80	55		

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092503.D Page 1
Report Date: 11-Oct-2019 08:02

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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092503.D
Lab Smp Id: CCV Client Smp ID: CCV
Inj Date : 25-SEP-2019 11:01
Operator : PC Inst ID: voa6.i
Smp Info : CCV;CCV;2;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 3 Continuing Calibration Sample
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

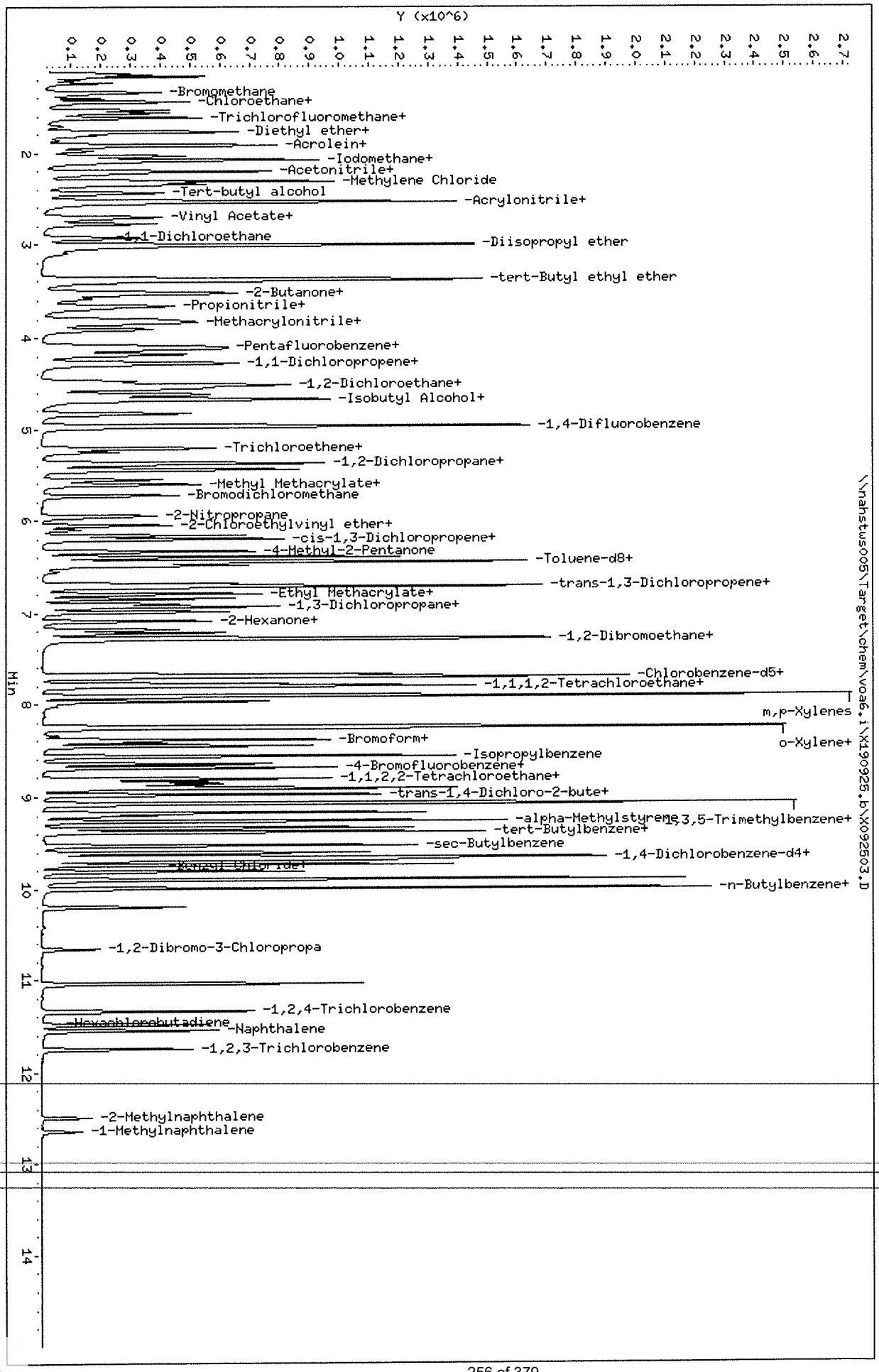
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.840	6.847	(0.892)	158490	50.0000	49.83
11 1,1-Dichloroethene	96	1.919	1.912	(0.459)	152831	50.0000	43.62
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	256804	50.0000	45.18
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	216435	50.0000	43.33
17 Methylene Chloride	84	2.306	2.306	(0.551)	208018	50.0000	47.62
38 Trichloroethene	130	5.214	5.214	(1.049)	207737	50.0000	44.39
5 Vinyl Chloride	62	1.138	1.138	(0.272)	224064	50.0000	43.75
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	227197	50.0000	49.36
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	274471	50.0000	51.94
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	198348	50.0000	50.21
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	728581	50.0000	46.78
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	404585	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	610397	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	554193	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	288562	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092503.D
Date : 25-SEP-2019 11:01
Client ID: CCV
Sample Info: CCV;CCV;2;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092505.D
Lab Smp Id: VLCSW-190925 Client Smp ID: VLCSW-190925
Inj Date : 25-SEP-2019 11:49
Operator : PC Inst ID: voa6.i
Smp Info : VLCSW-190925;VLCSW-190925;3;;LCS
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 5 QC Sample: LCS
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

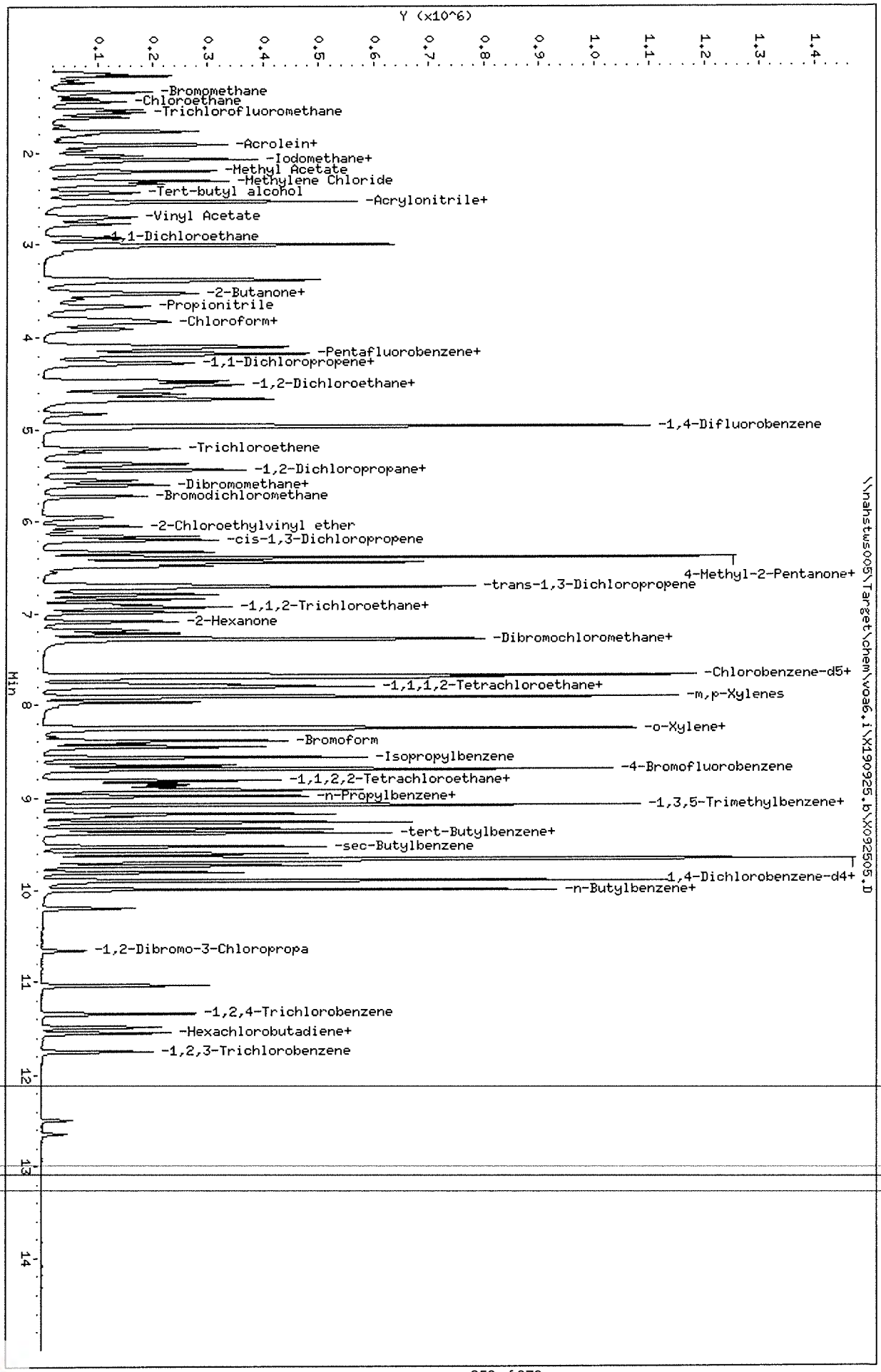
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	68691	20.4981	20.49
11 1,1-Dichloroethene	96	1.919	1.912	(0.458)	64786	18.3035	18.30
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	112288	19.2000	19.20
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	95018	18.8293	18.82
17 Methylene Chloride	84	2.305	2.306	(0.550)	92598	20.0264	20.02
38 Trichloroethene	130	5.214	5.214	(1.049)	86532	17.9731	17.97
5 Vinyl Chloride	62	1.138	1.138	(0.272)	92102	17.7999	17.79
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	239641	51.5765	51.57
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	289677	53.5437	53.54
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	208081	52.1776	52.17
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	761215	47.7101	47.71
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	408763	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	628097	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	567818	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	299106	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092505.D
Date : 25-SEP-2019 11:49
Client ID: VLCSW-190925
Sample Info: VLCSW-190925;VLCSW-190925;3;;LCS
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092507.D Page 1
Report Date: 11-Oct-2019 08:02

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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092507.D
Lab Smp Id: VBLKW-190925 Client Smp ID: VBLKW-190925
Inj Date : 25-SEP-2019 12:37
Operator : PC Inst ID: voa6.i
Smp Info : VBLKW-190925;VBLKW-190925;3;;BLANK
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 7 QC Sample: BLANK
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

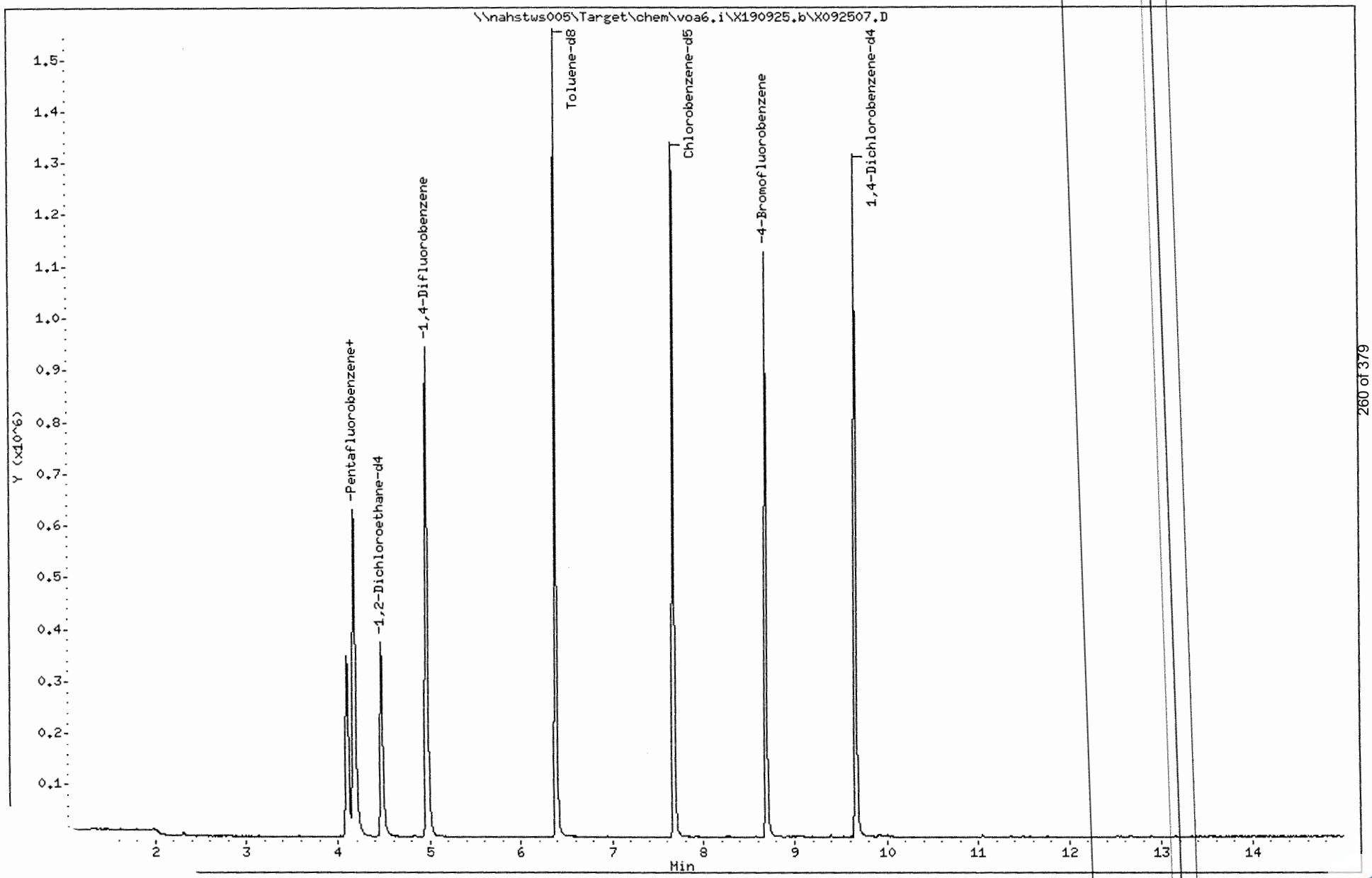
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	273241	44.7479	44.74
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	324690	51.4450	51.44
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	243664	46.5334	46.53
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	938071	50.4436	50.44
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	535673	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	789626	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	661823	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	316092	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092507.D
Date : 25-SEP-2019 12:37
Client ID: VBLKW-190925
Sample Info: VBLKW-190925;VBLKW-190925;3;;BLANK
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092510.D
Lab Smp Id: HS19090860-15 Client Smp ID: HS19090860-15
Inj Date : 25-SEP-2019 13:49
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-15;HS19090860-15;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 10
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

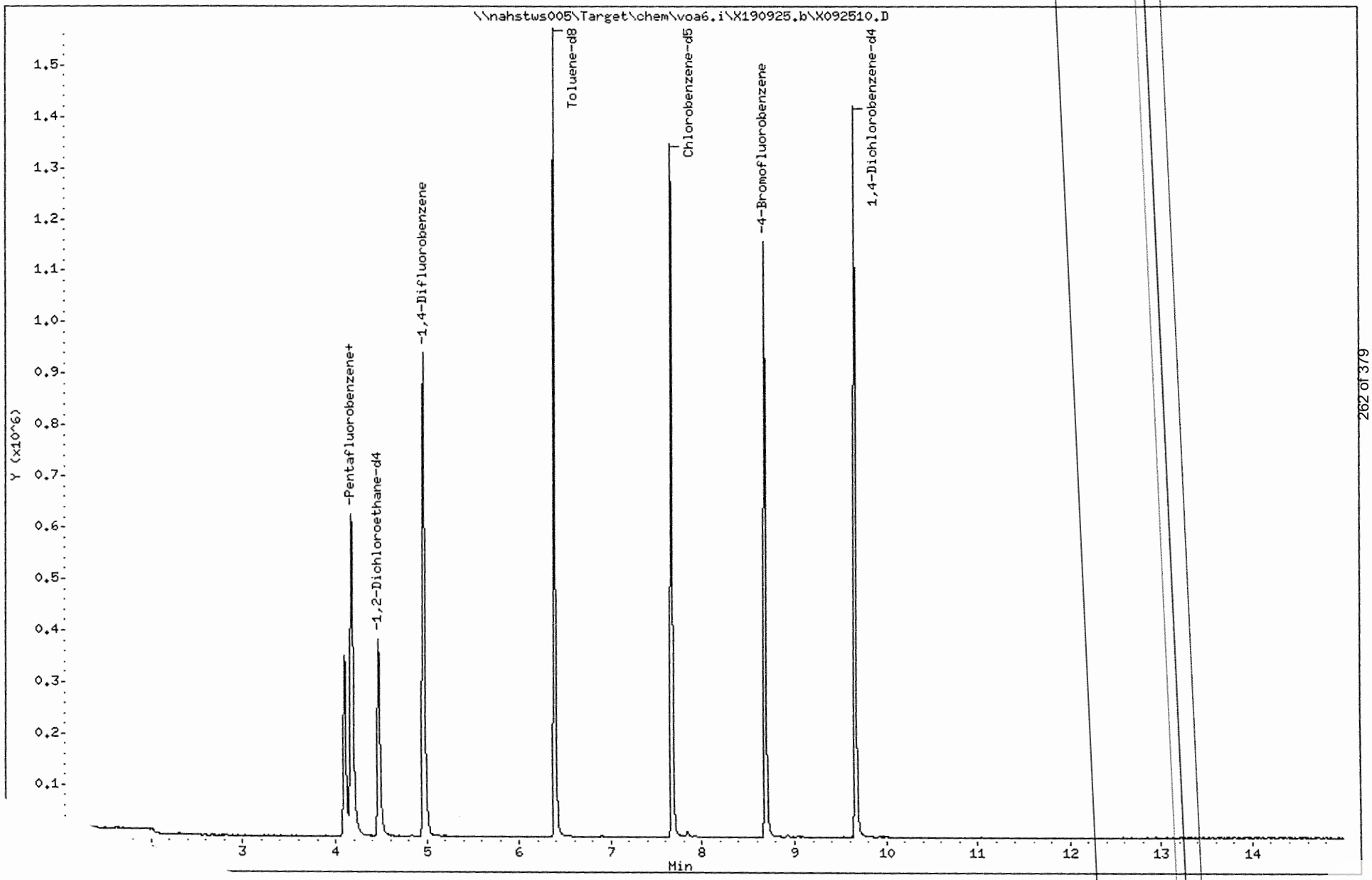
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	282958	46.2231	46.22
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	333443	52.2247	52.22
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	248474	47.3147	47.31
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	943162	50.1174	50.11
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	537387	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	793526	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	669745	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	343923	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092510.D
Date : 25-SEP-2019 13:49
Client ID: HS19090860-15
Sample Info: HS19090860-15;HS19090860-15;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092511.D
Lab Smp Id: HS19090860-16 Client Smp ID: HS19090860-16
Inj Date : 25-SEP-2019 14:13
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-16;HS19090860-16;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 11
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

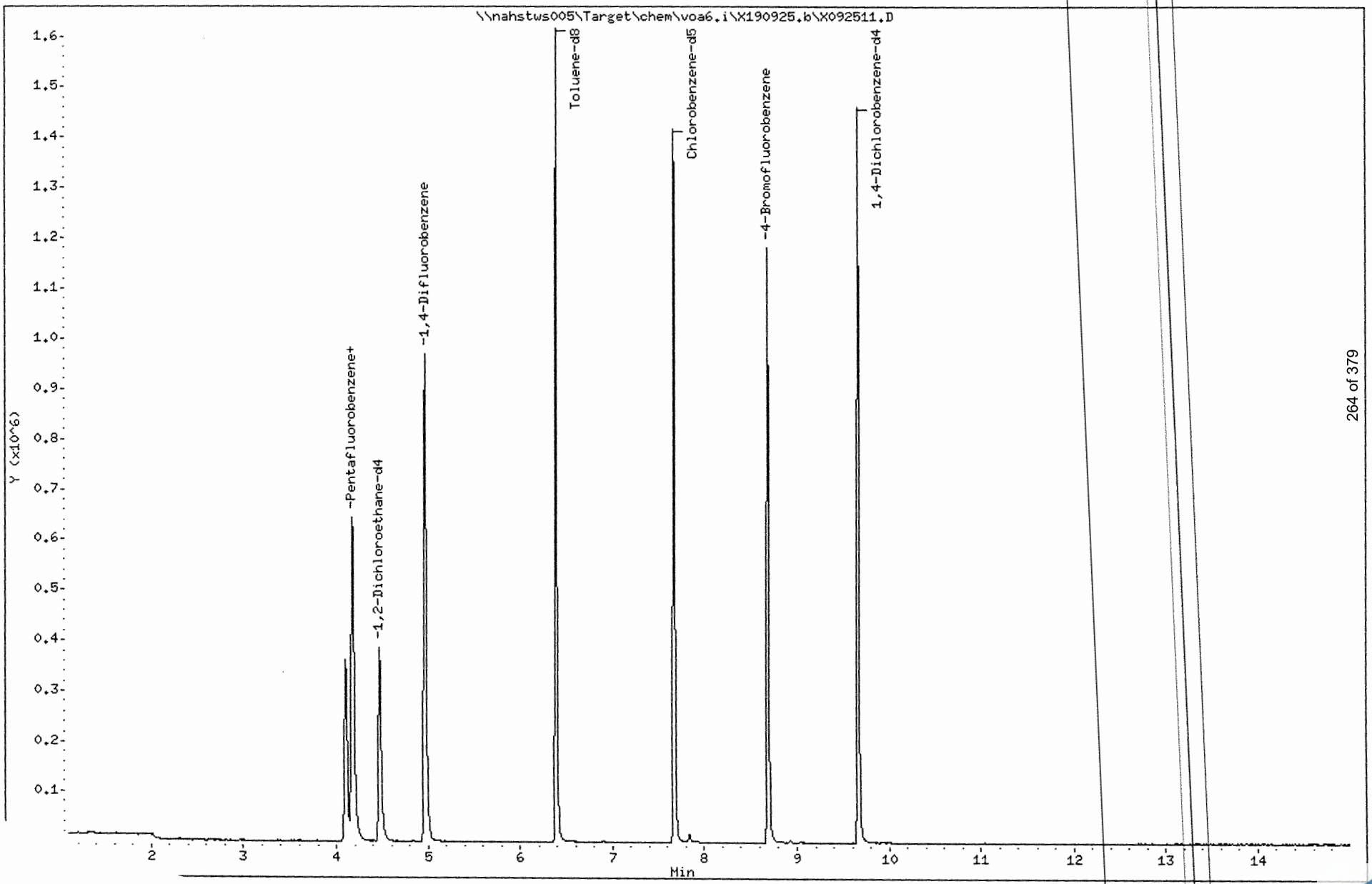
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	282593	44.7921	44.79
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	345188	52.1508	52.15
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	251929	46.5651	46.56
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	963318	49.3784	49.37
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	553472	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	811724	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	694295	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	355507	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092511.D
Date : 25-SEP-2019 14:13
Client ID: HS19090860-16
Sample Info: HS19090860-16;HS19090860-16;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D Page 1
Report Date: 11-Oct-2019 08:00

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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D
Lab Smp Id: HS19090860-04 Client Smp ID: HS19090860-04
Inj Date : 25-SEP-2019 14:37
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-04;HS19090860-04;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 12
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	1724907	259.873	259.87(A)
38 Trichloroethene	130	5.214	5.214	(1.049)	176747	28.9227	28.92
5 Vinyl Chloride	62	1.138	1.138	(0.272)	7227	1.06188	1.06(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	279386	45.6039	45.60
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	340861	52.4537	52.45
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	247419	47.0862	47.08
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	947587	49.4679	49.46
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	537656	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	797235	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	681722	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	350631	50.0000	

QC Flag Legend

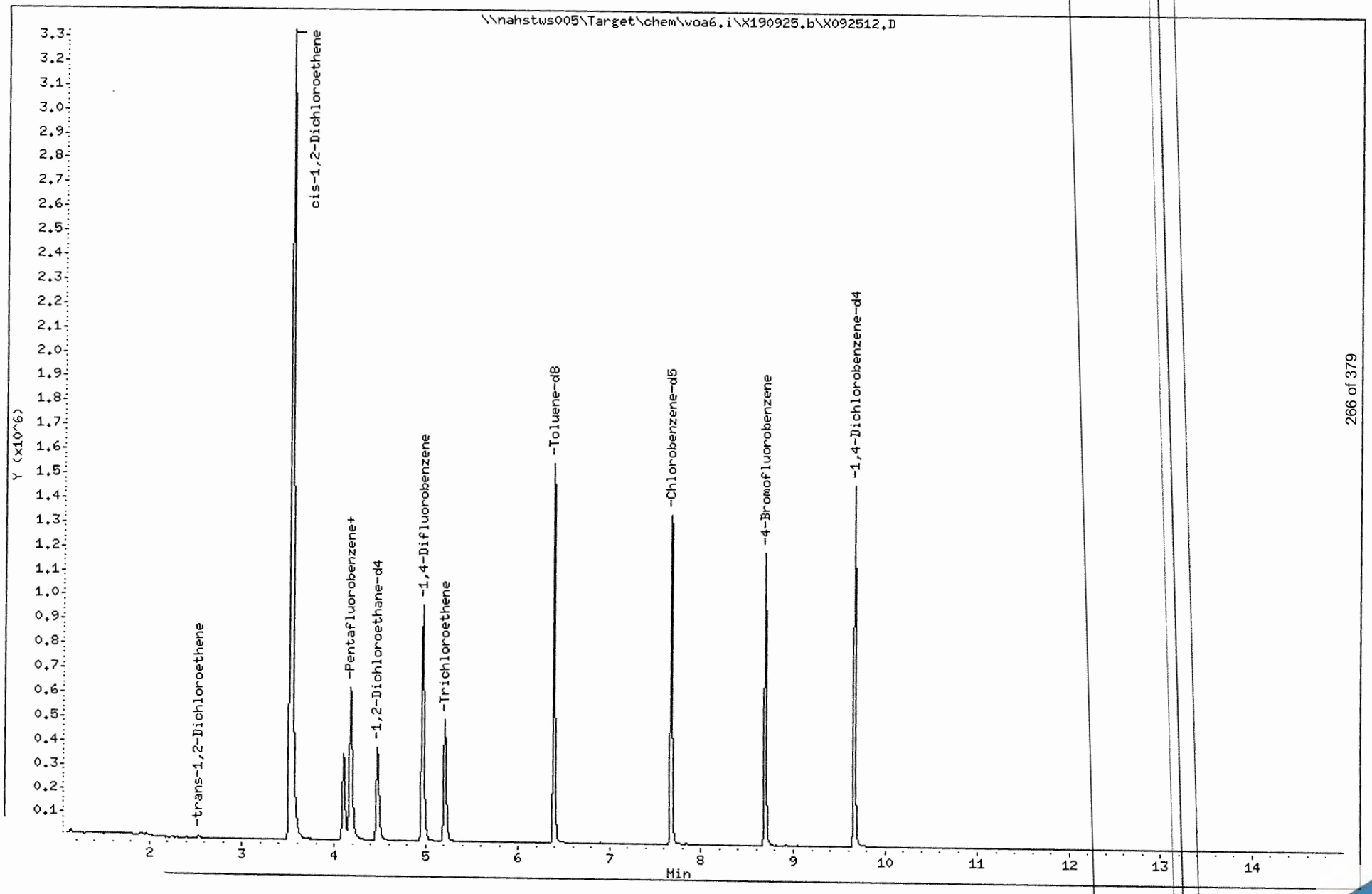
a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).
A - Target compound detected but, quantitated amount exceeded maximum amount.

01030025

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D
Date : 25-SEP-2019 14:37
Client ID: HS19090860-04
Sample Info: HS19090860-04;HS19090860-04;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D

Date : 25-SEP-2019 14:37

Client ID: HS19090860-04

Instrument: voa6.i

Sample Info: HS19090860-04;HS19090860-04;;;

Purge Volume: 5.0

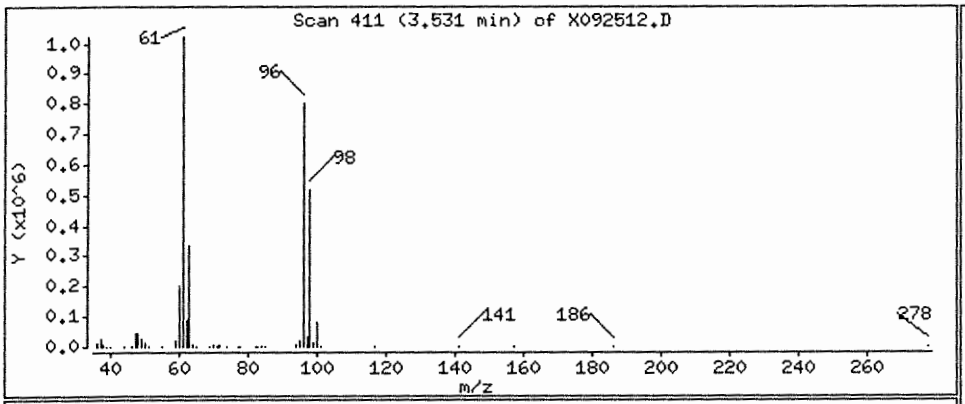
Operator: PC

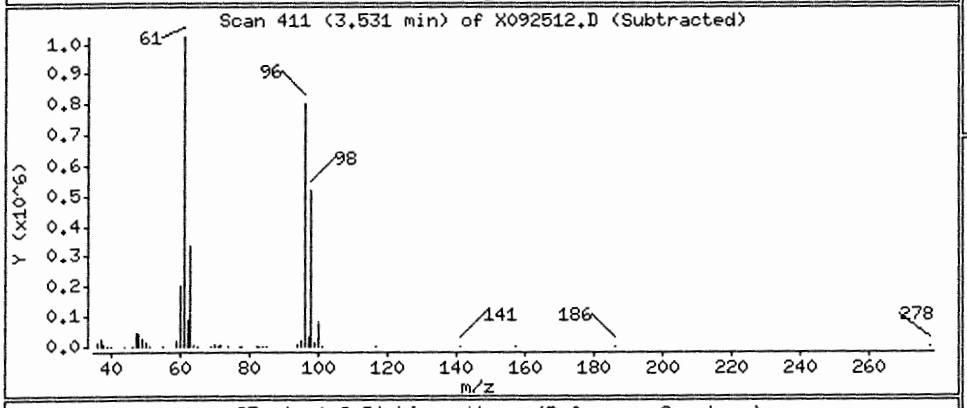
Column phase: DB624

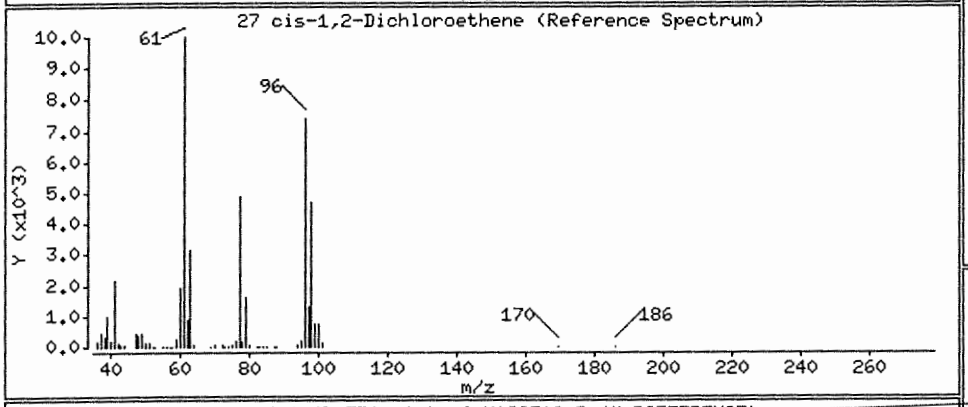
Column diameter: 0.18

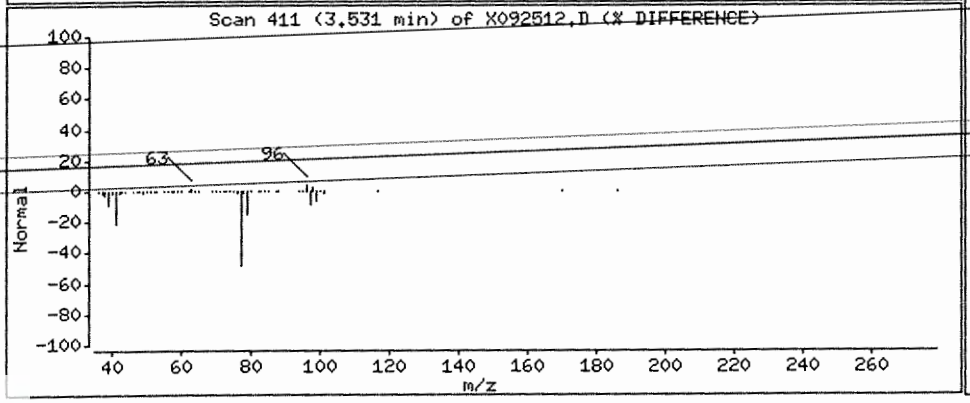
27 cis-1,2-Dichloroethene

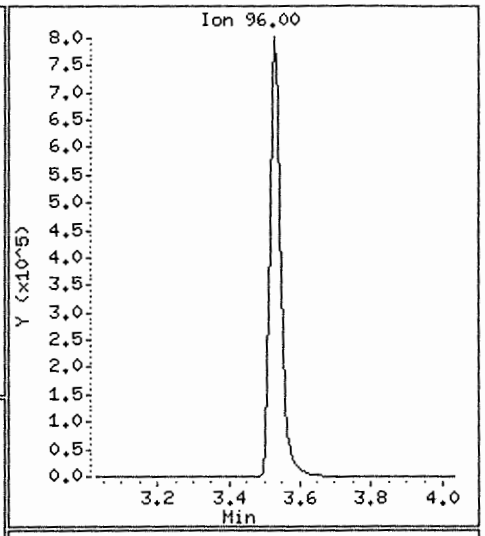
Concentration: 259.87 ug/l

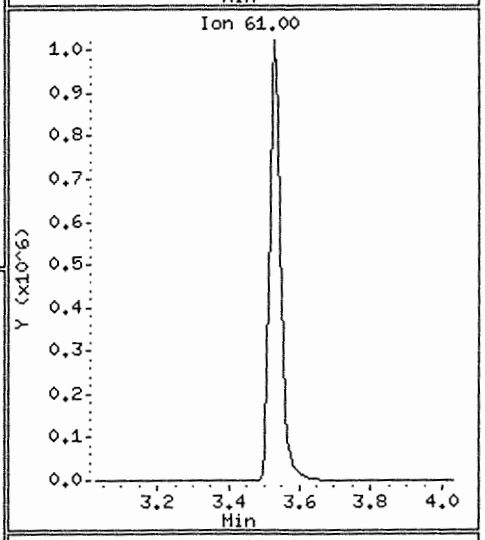


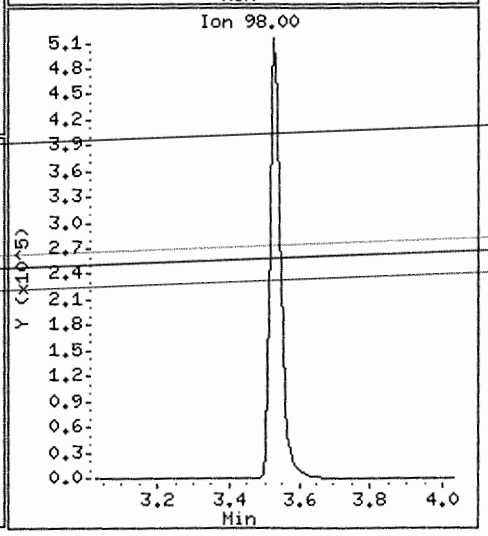












,a File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D

ate : 25-SEP-2019 14:37

Client ID: HS19090860-04

Instrument: voa6.i

Sample Info: HS19090860-04;HS19090860-04;;;

Purge Volume: 5.0

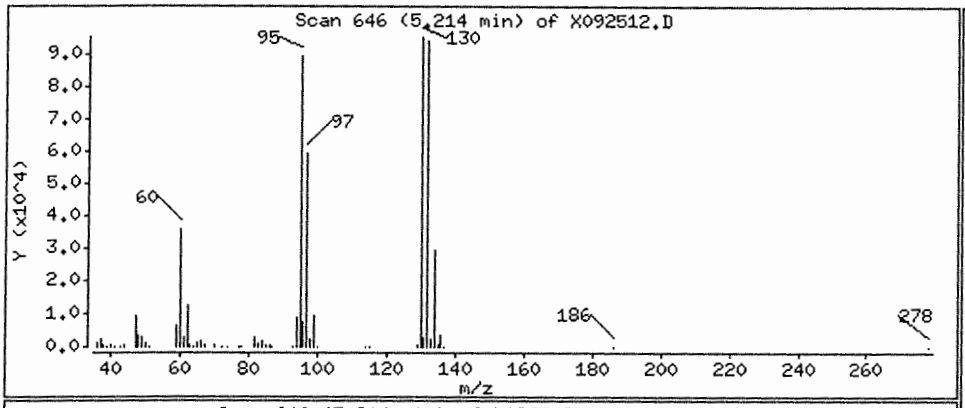
Operator: PC

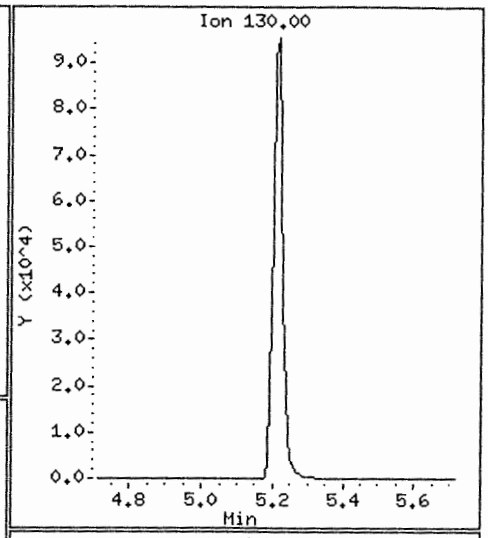
Column phase: DB624

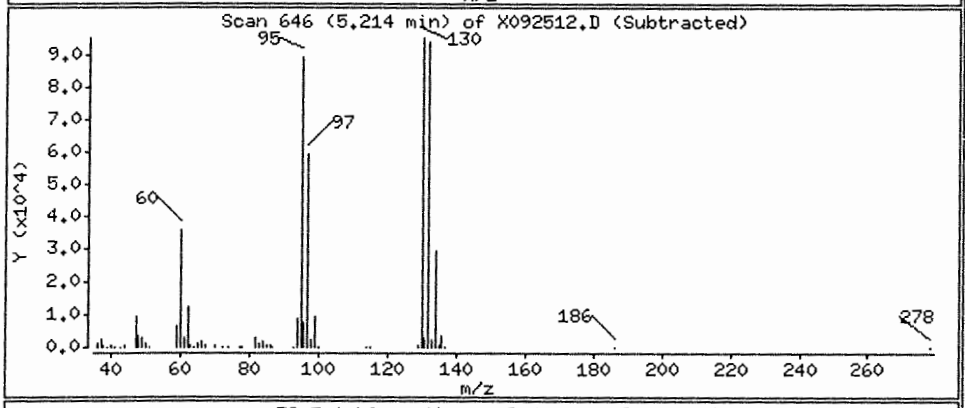
Column diameter: 0.18

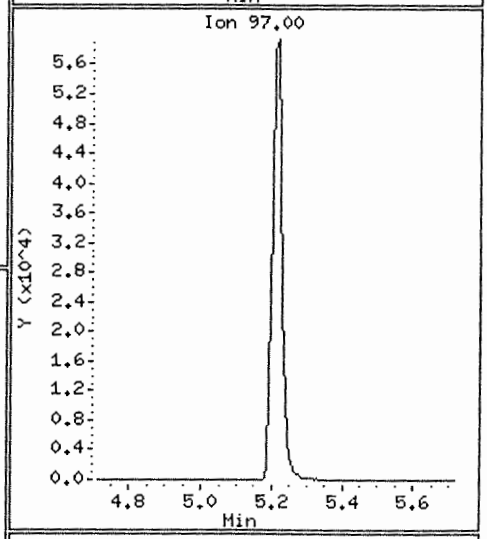
38 Trichloroethene

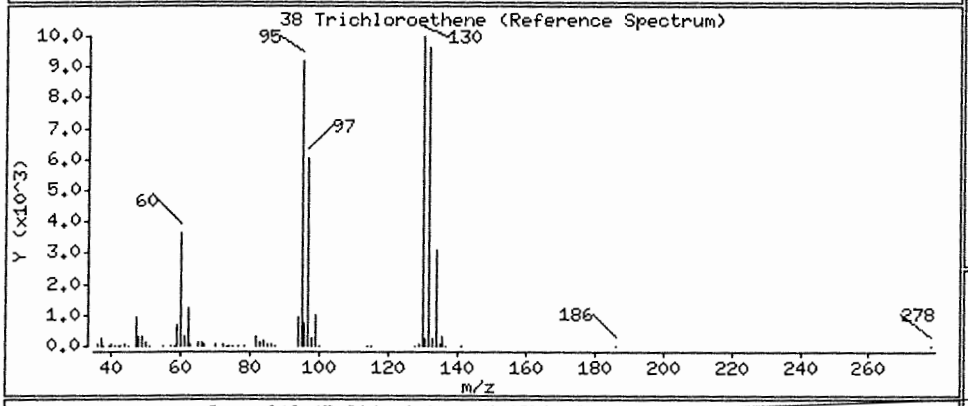
Concentration: 28.92 ug/l

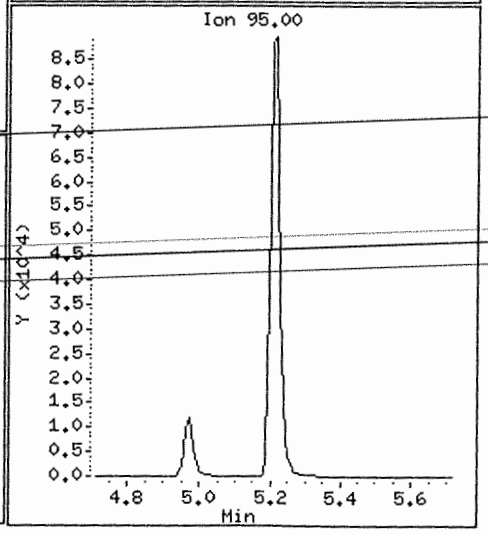


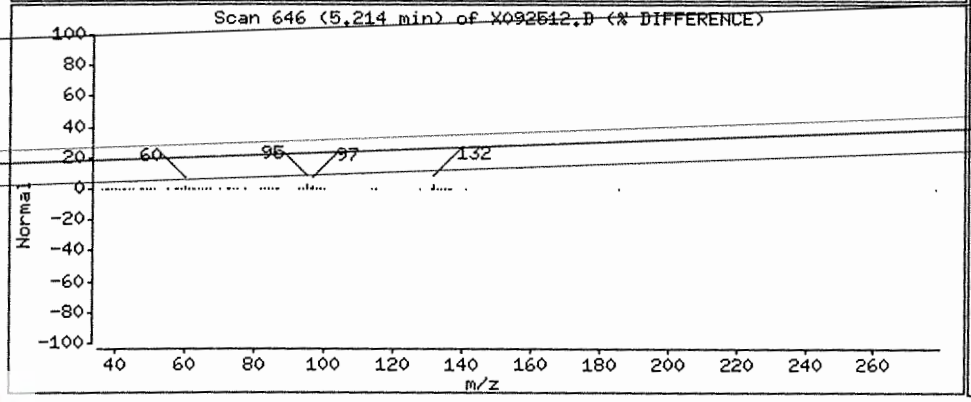












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092512.D

Date : 25-SEP-2019 14:37

Client ID: HS19090860-04

Instrument: voa6.i

Sample Info: HS19090860-04;HS19090860-04;;;

Purge Volume: 5.0

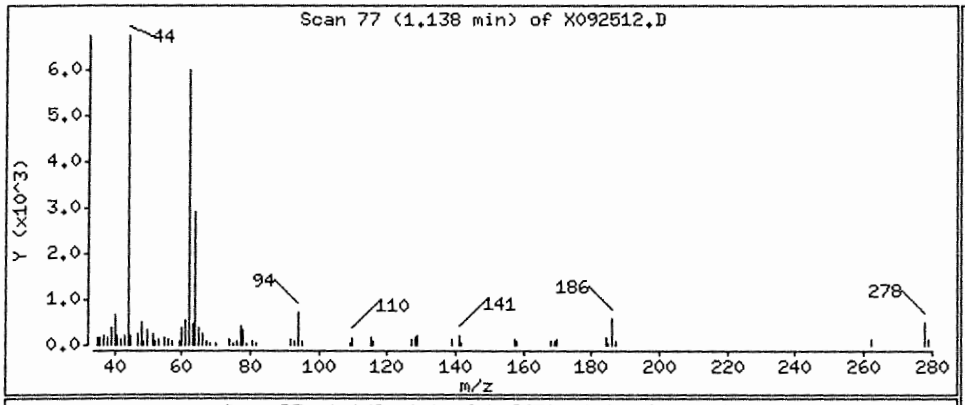
Operator: PC

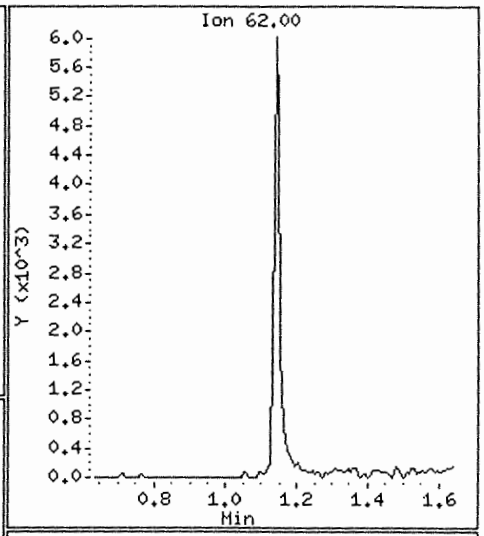
Column phase: DB624

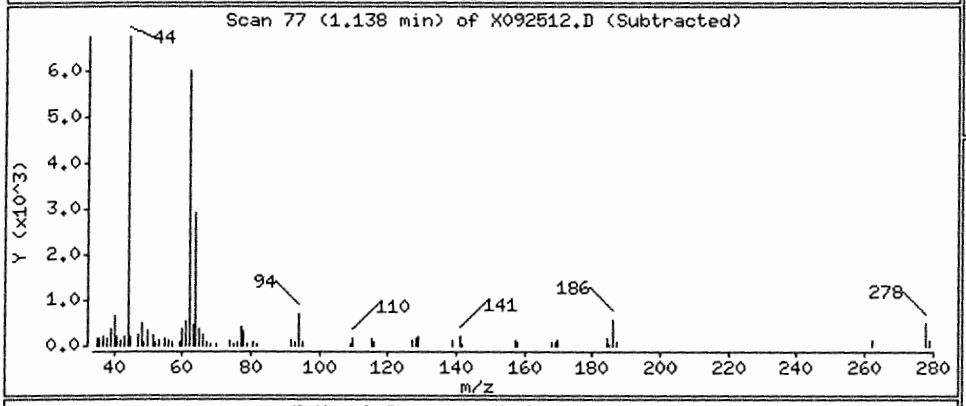
Column diameter: 0.18

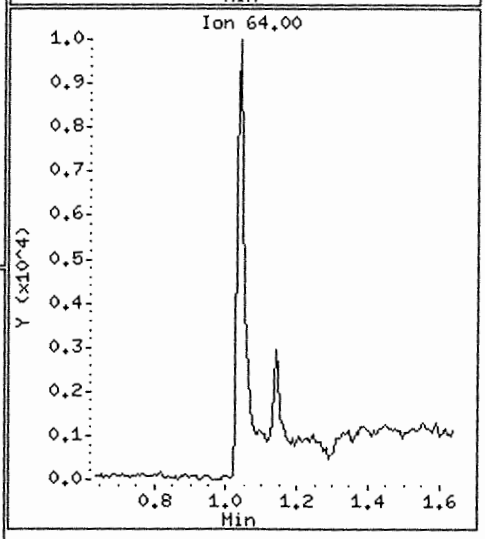
5 Vinyl Chloride

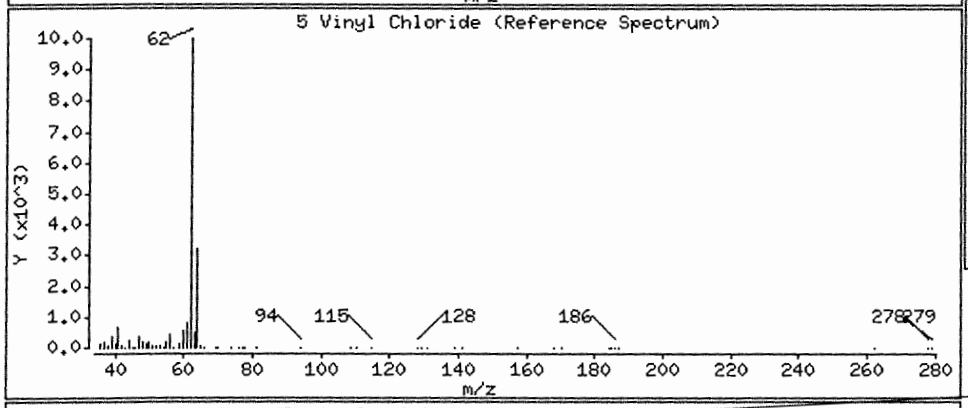
Concentration: 1.06 ug/l

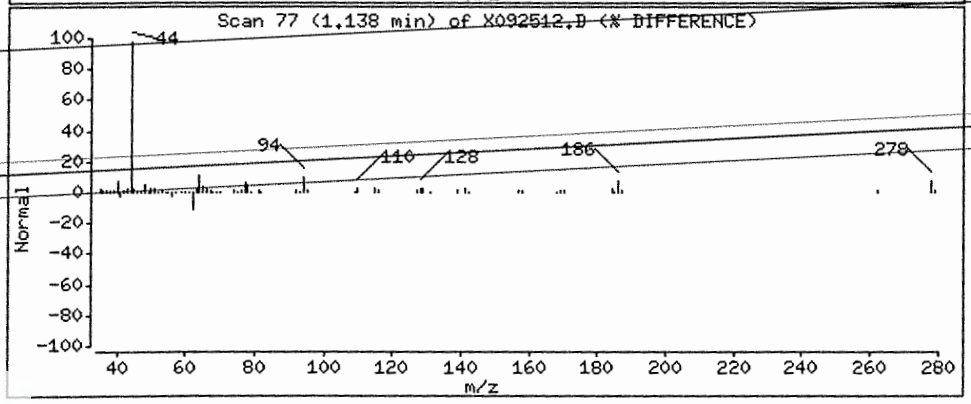












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Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D
Lab Smp Id: HS19090860-03 Client Smp ID: HS19090860-03
Inj Date : 25-SEP-2019 15:02
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-03;HS19090860-03;;;
Misc Info : HS18090001;WATER;0;25;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 13
Dil Factor: 25.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	25.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

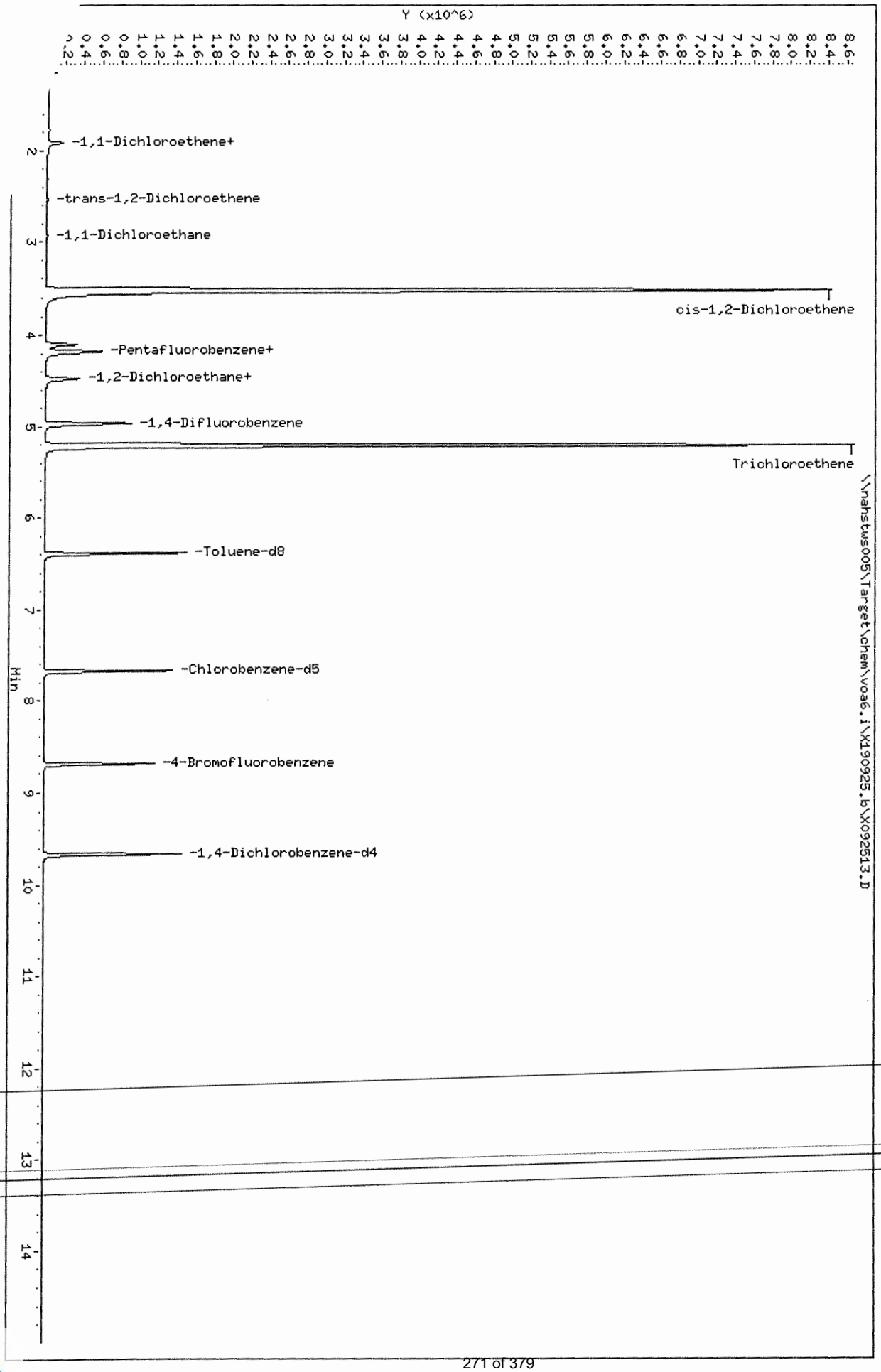
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.911	1.912	(0.456)	34598	7.71194	192.79
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	3906	0.53911	13.47(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	4470506	698.948	17473.70(A)
38 Trichloroethene	130	5.214	5.214	(1.049)	3089716	518.018	12950.44(A)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	61417	9.36476	234.11
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	271158	45.9387	45.93
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	336260	53.0614	53.06
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	238583	47.1192	47.11
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	902833	48.3176	48.31
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	518098	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	778122	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.671	(1.000)	664988	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	357165	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).
A - Target compound detected but, quantitated amount exceeded maximum amount.

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D
Date : 25-SEP-2019 15:02
Client ID: HS19090860-03
Sample Info: HS19090860-03;HS19090860-03;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



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Date : 25-SEP-2019 15:02

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

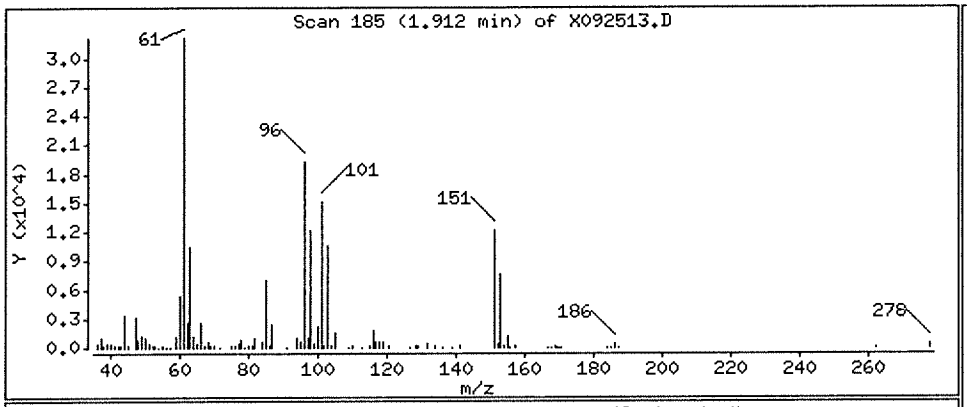
Operator: PC

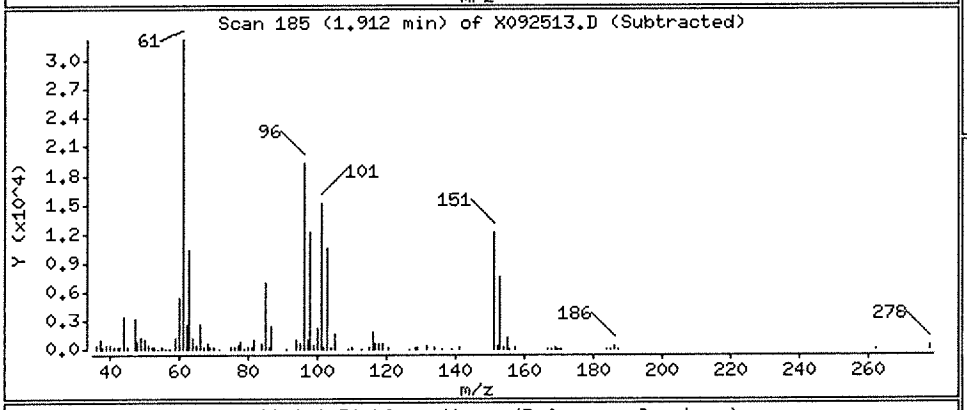
Column phase: DB624

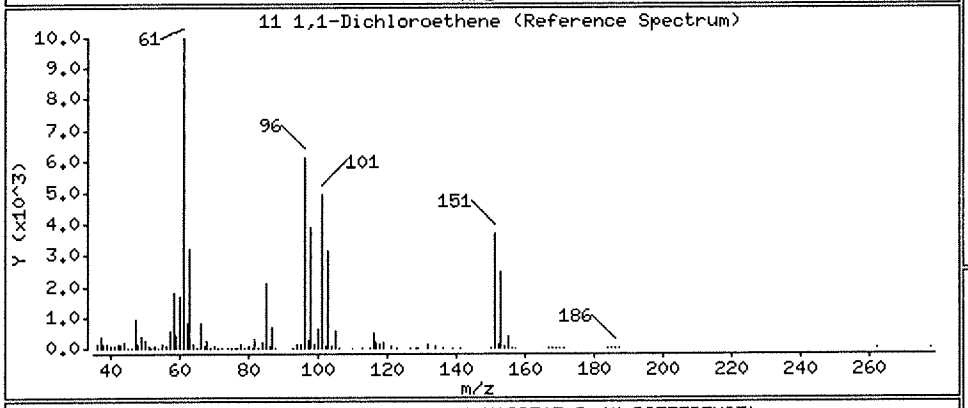
Column diameter: 0.18

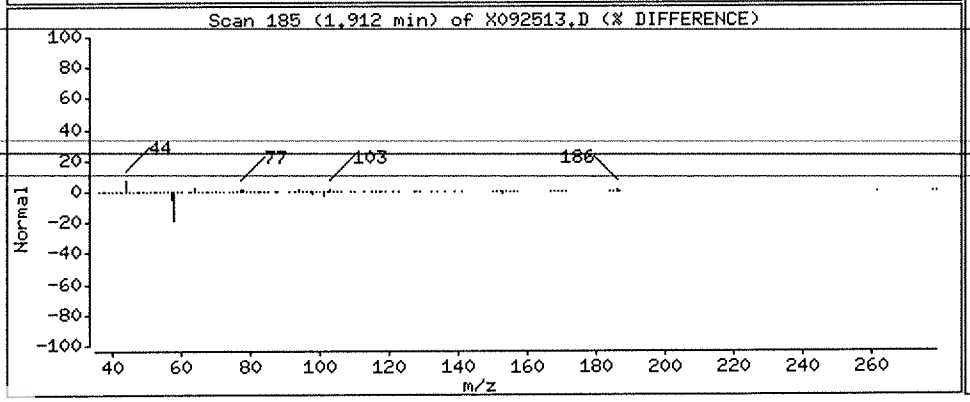
11 1,1-Dichloroethene

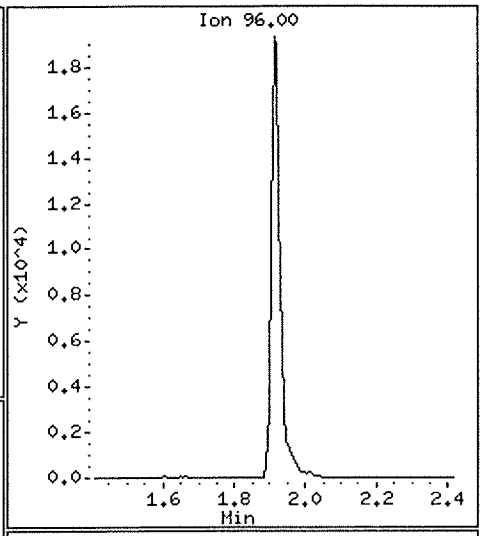
Concentration: 192.79 ug/l

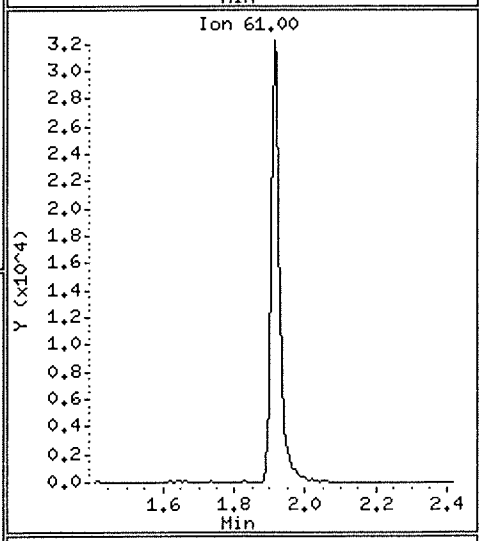


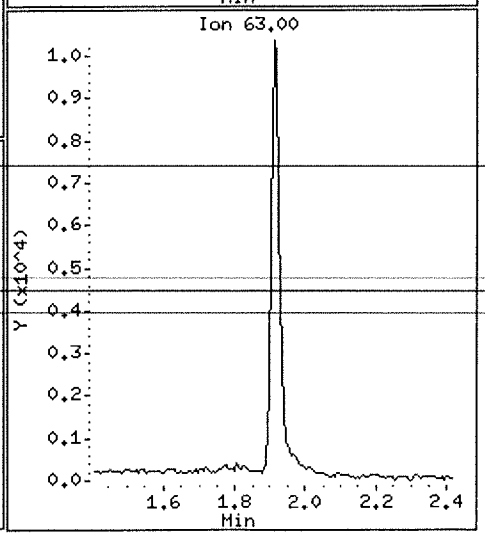












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D

Date : 25-SEP-2019 15:02

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

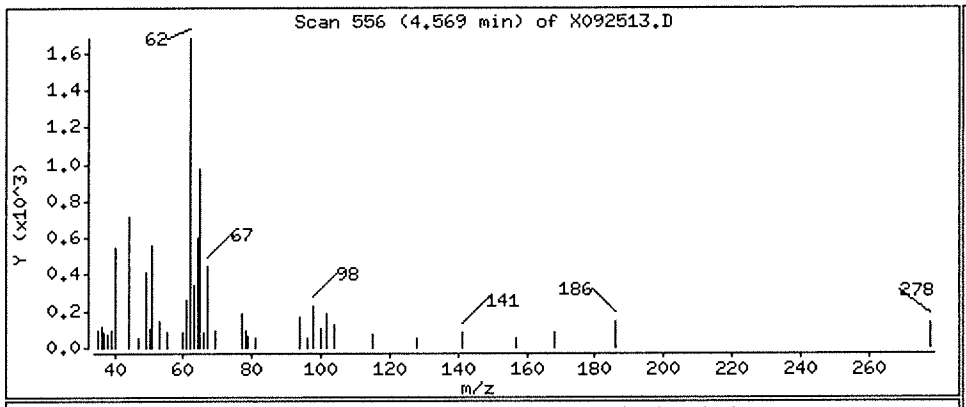
Operator: PC

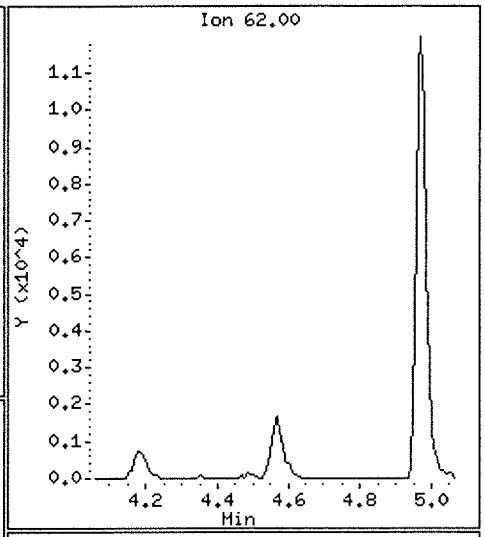
Column phase: DB624

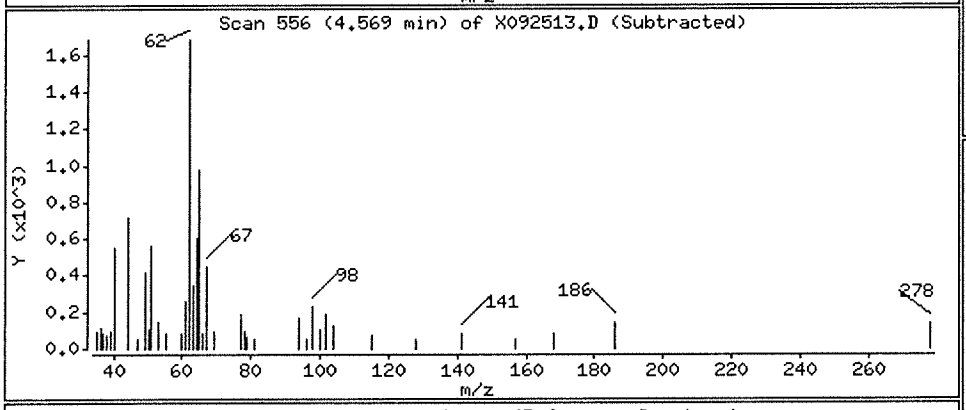
Column diameter: 0.18

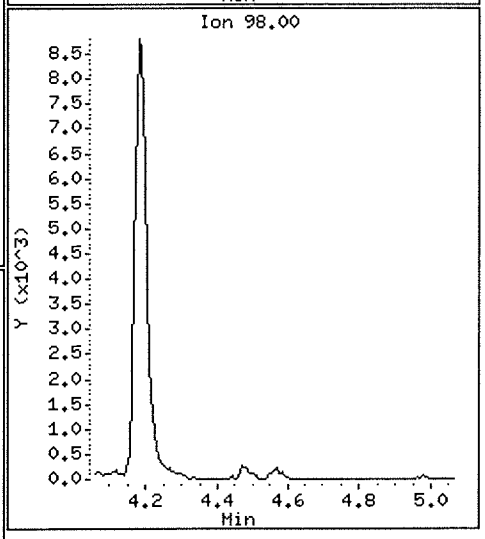
33 1,2-Dichloroethane

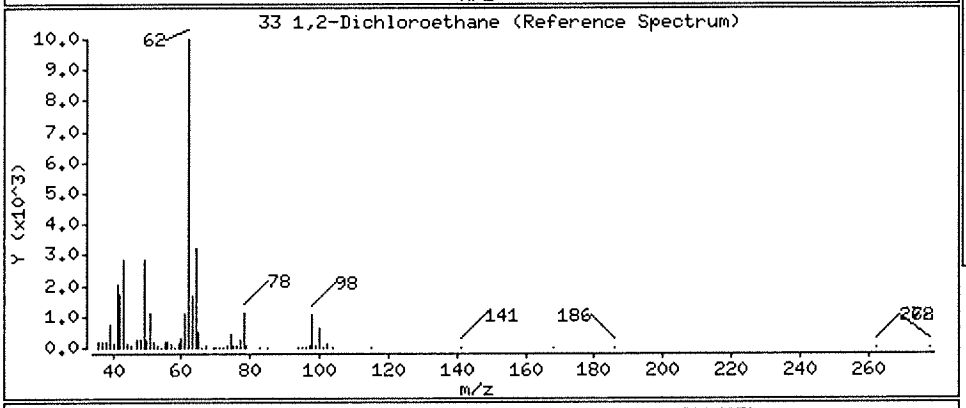
Concentration: 13.47 ug/l

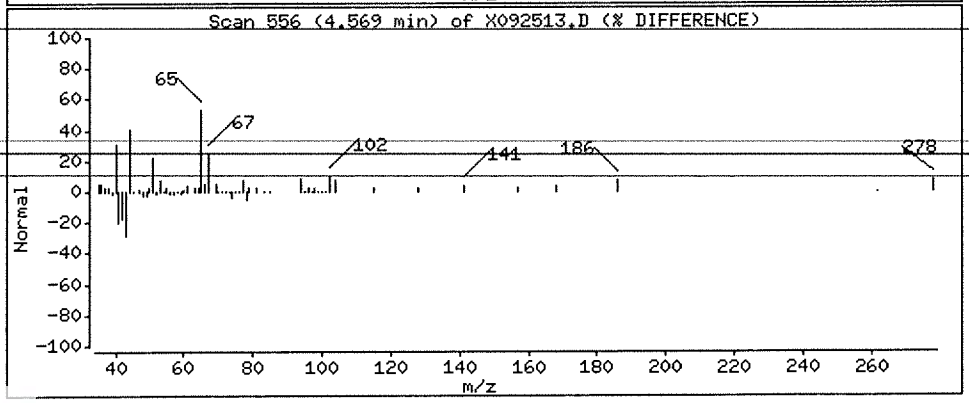












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D

Date : 25-SEP-2019 15:02

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

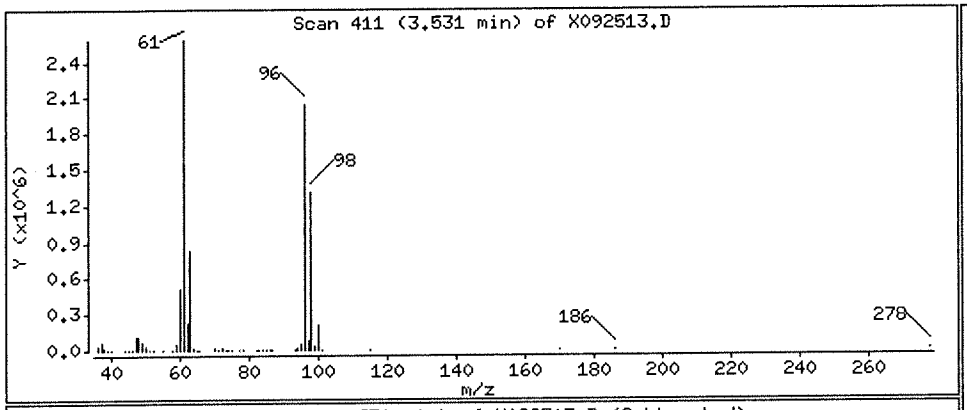
Operator: PC

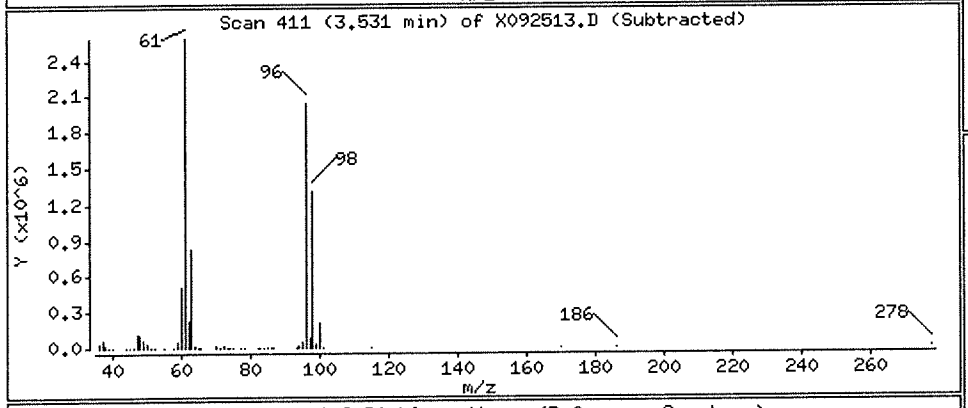
Column phase: DB624

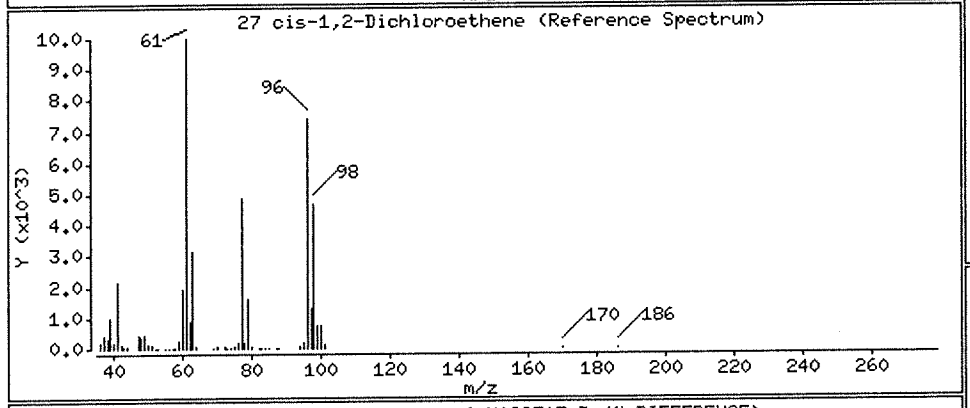
Column diameter: 0.18

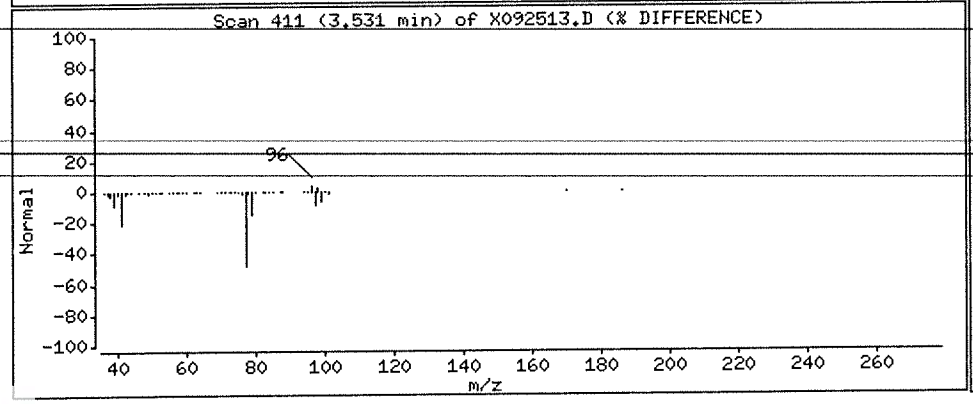
27 cis-1,2-Dichloroethene

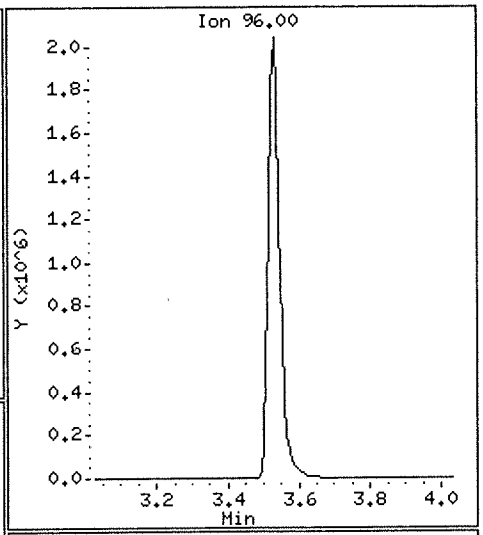
Concentration: 17473.70 ug/l

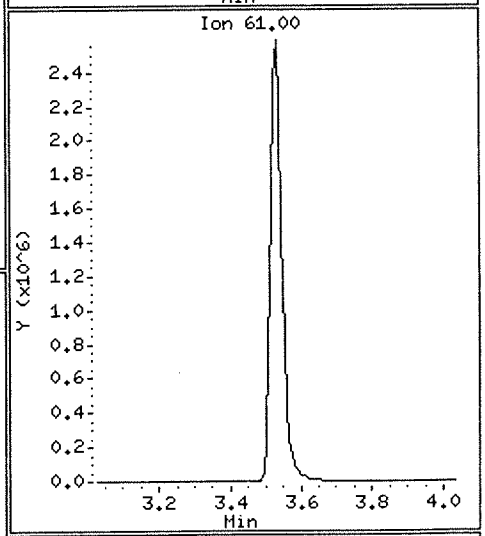


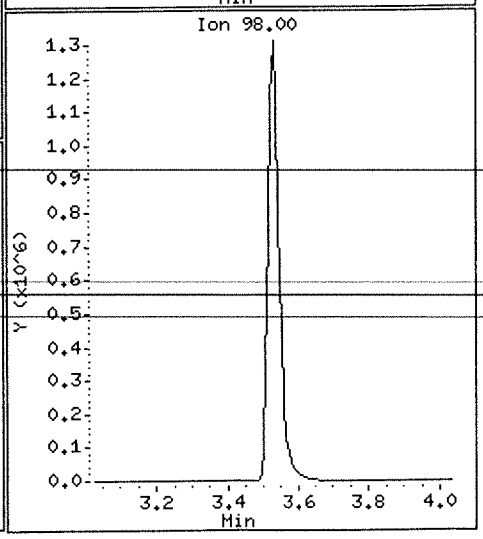












ata File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D

Date : 25-SEP-2019 15:02

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

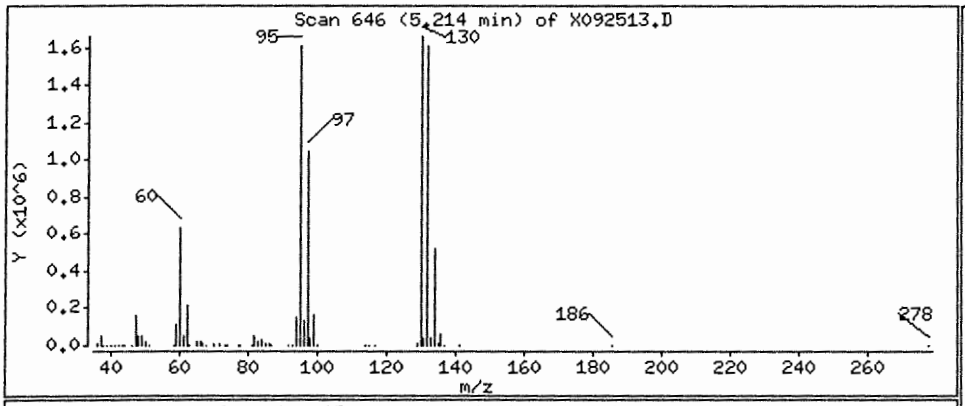
Operator: PC

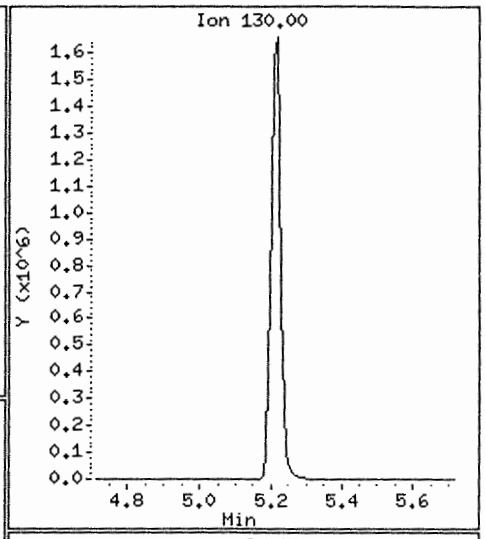
Column phase: DB624

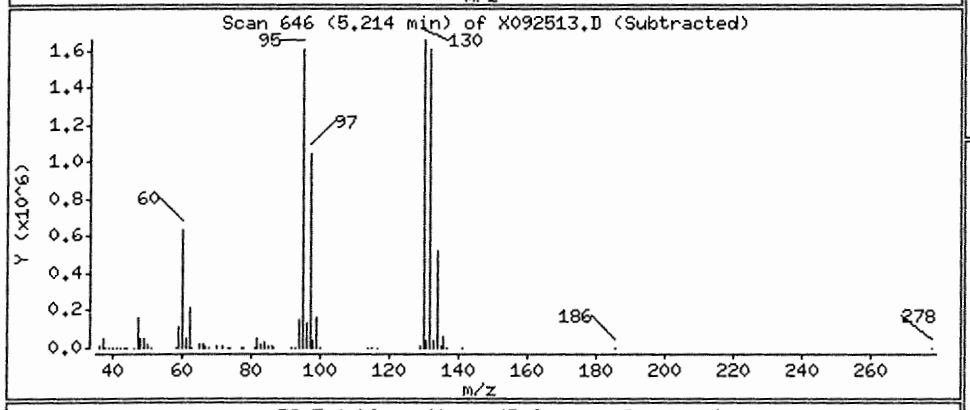
Column diameter: 0.18

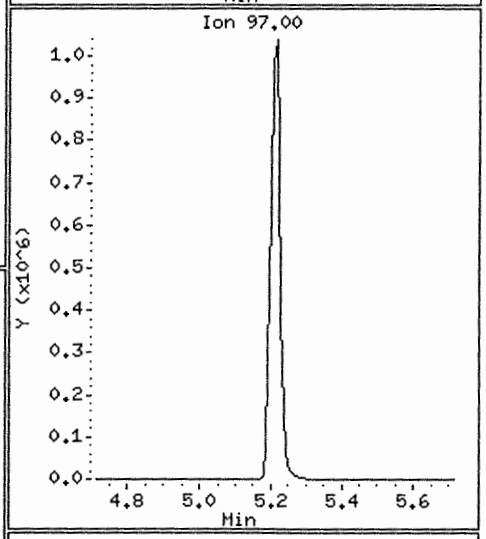
38 Trichloroethene

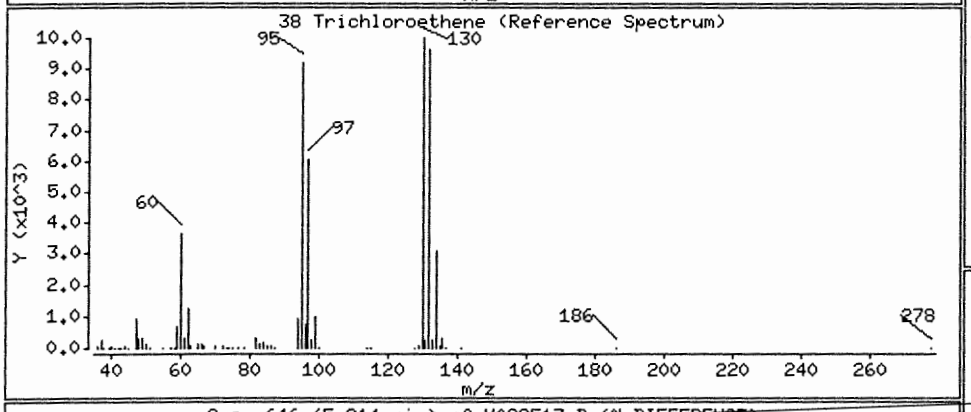
Concentration: 12950.44 ug/l

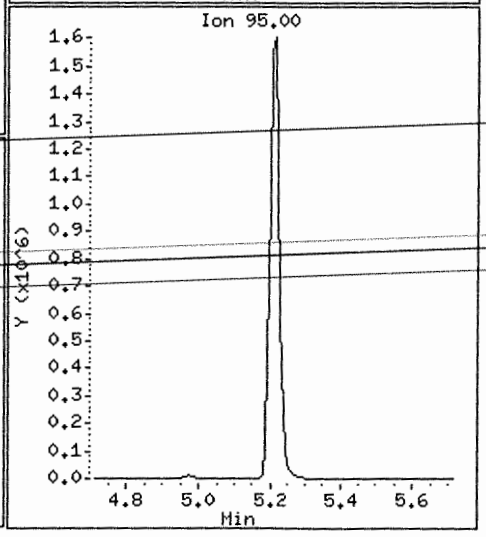


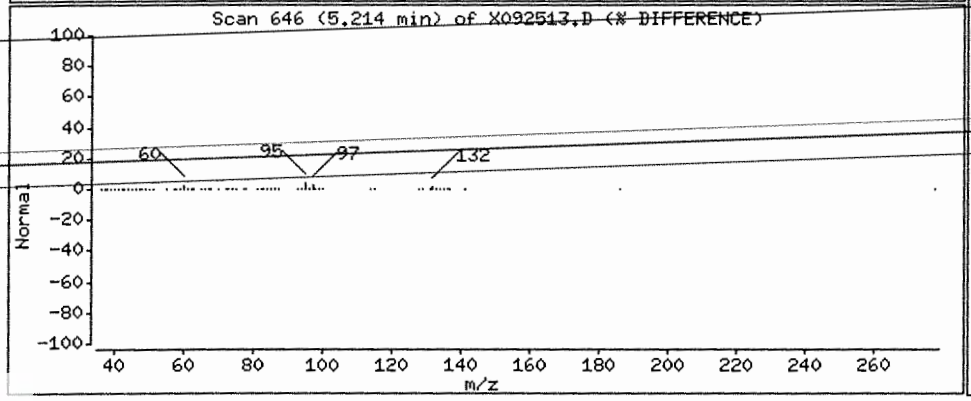












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092513.D

Date : 25-SEP-2019 15:02

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

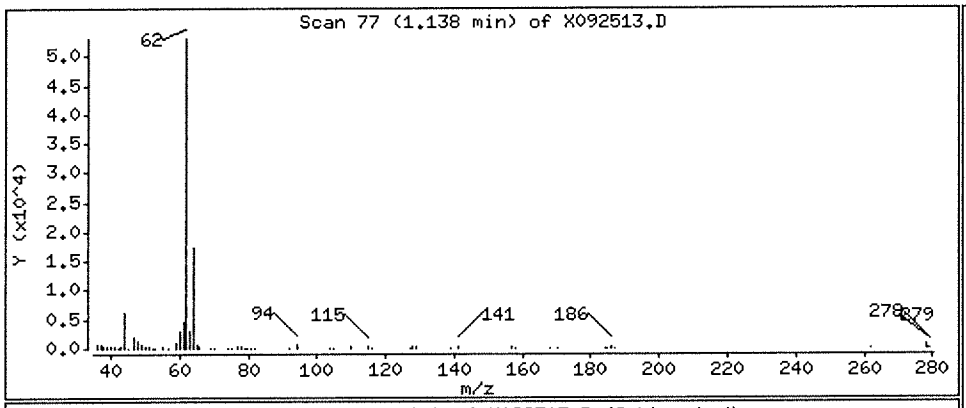
Operator: PC

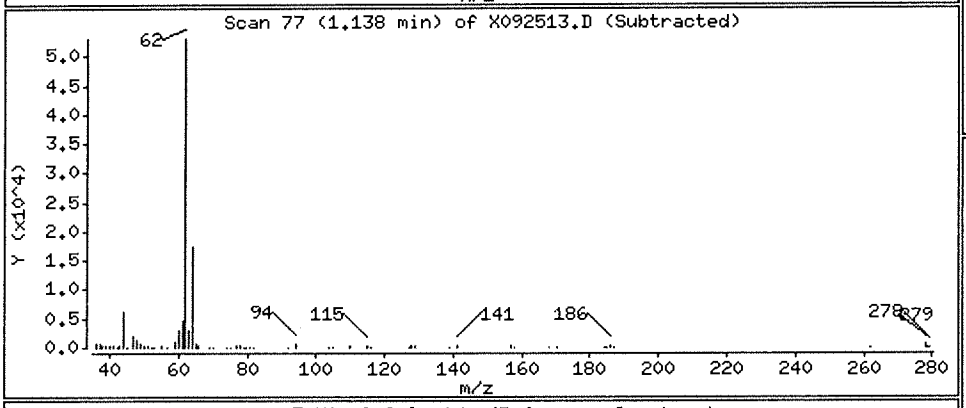
Column phase: DB624

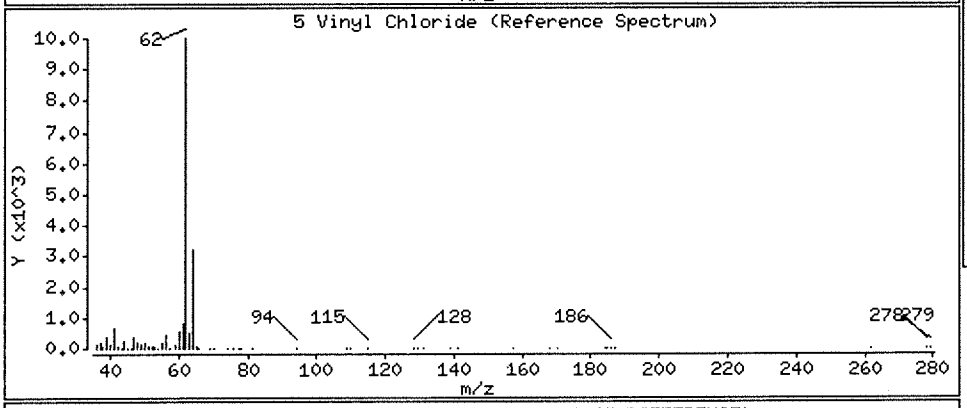
Column diameter: 0.18

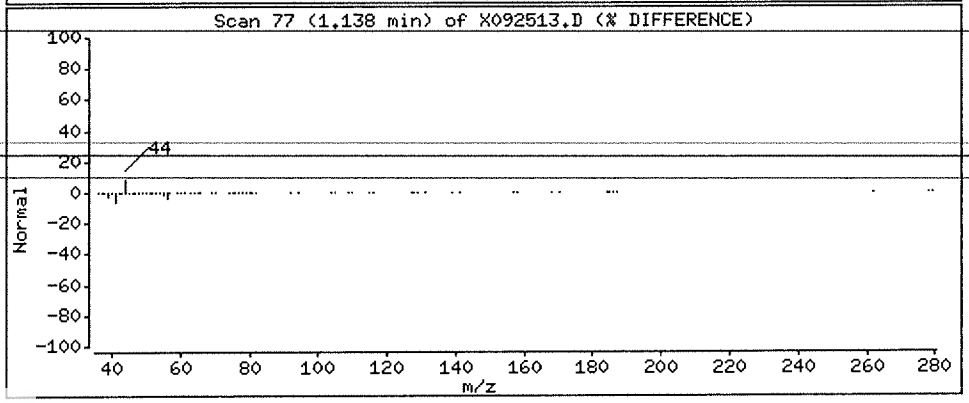
5 Vinyl Chloride

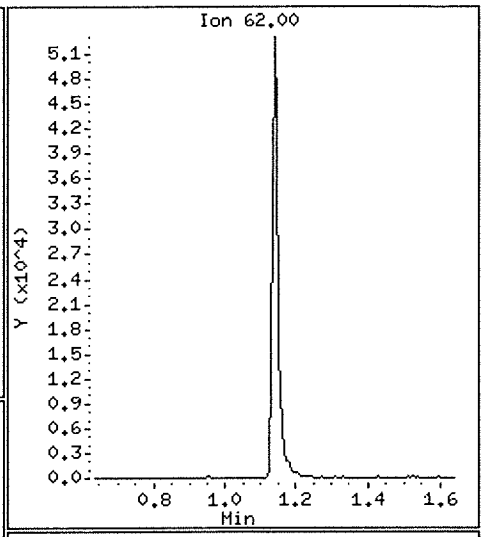
Concentration: 234.11 ug/l

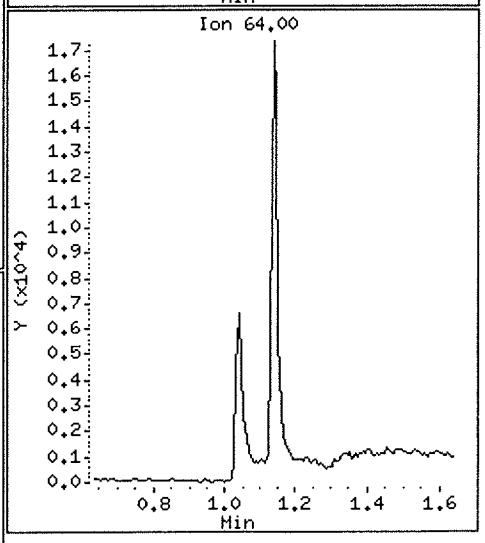












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092514.D Page 1
Report Date: 11-Oct-2019 08:02

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092514.D
Lab Smp Id: HS19090847-01MS Client Smp ID: HS19090847-01MS
Inj Date : 25-SEP-2019 15:26
Operator : PC Inst ID: voa6.i
Smp Info : HS19090847-01MS;HS19090847-01MS;3;;MS
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 14 QC Sample: MS
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

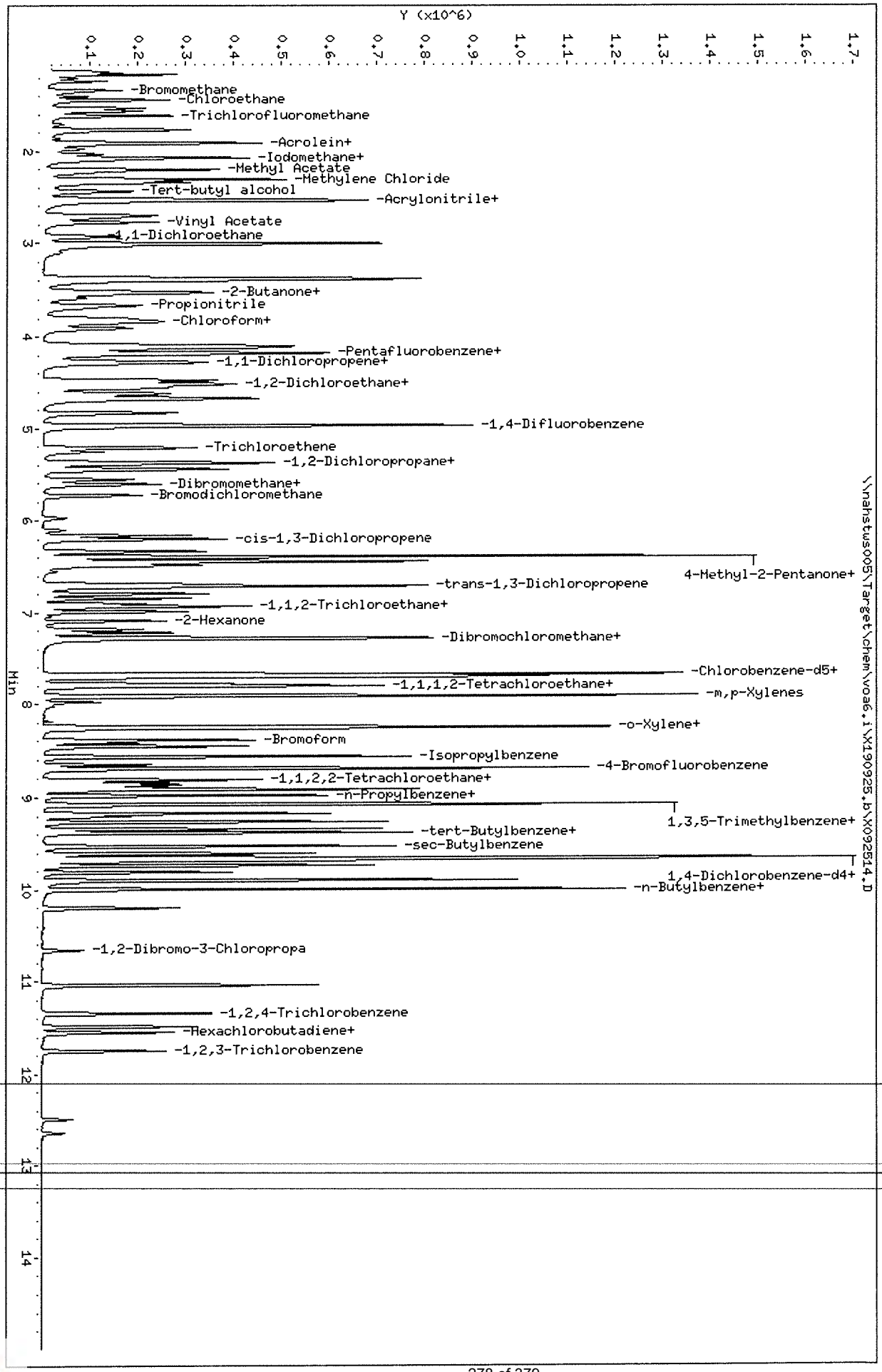
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	74617	19.4811	19.48
11 1,1-Dichloroethene	96	1.912	1.912	(0.457)	76473	17.2199	17.21
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	124141	17.7590	17.75
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	125980	19.8976	19.89
17 Methylene Chloride	84	2.306	2.306	(0.551)	98959	16.8043	16.80
38 Trichloroethene	130	5.214	5.214	(1.049)	114074	19.8230	19.82
5 Vinyl Chloride	62	1.138	1.138	(0.272)	93138	14.3465	14.34
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	265738	45.4702	45.47
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	312198	50.5460	50.54
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	235285	46.9390	46.93
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	896148	49.2616	49.26
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	512863	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	750742	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	647416	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	322512	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092514.D
Date : 25-SEP-2019 15:26
Client ID: HS190908 47-01MS
Sample Info: HS190908 47-01MS;HS190908 47-01MS;3;;MS
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092515.D Page 1
Report Date: 11-Oct-2019 08:02

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092515.D
Lab Smp Id: HS19090847-01MSD Client Smp ID: HS19090847-01MSD
Inj Date : 25-SEP-2019 15:50
Operator : PC Inst ID: voa6.i
Smp Info : HS19090847-01MSD;HS19090847-01MSD;3;;MSD
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 14 QC Sample: MSD
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

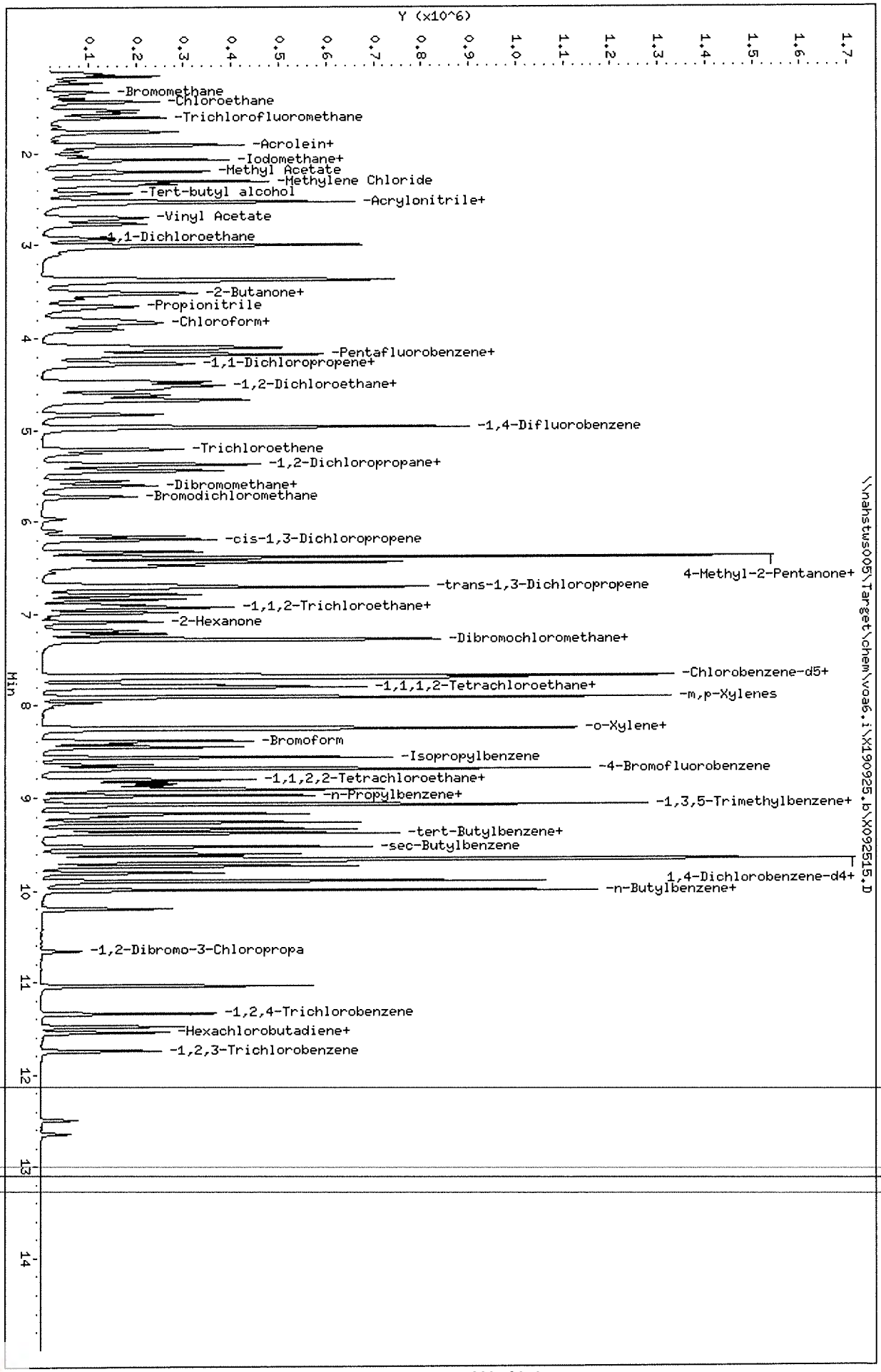
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	72430	18.6449	18.64
11 1,1-Dichloroethene	96	1.911	1.912	(0.457)	70353	15.9619	15.96
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	119242	17.0614	17.06
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	115251	18.3410	18.34
17 Methylene Chloride	84	2.305	2.306	(0.551)	94587	16.1204	16.12
38 Trichloroethene	130	5.214	5.214	(1.049)	105219	18.2877	18.28
5 Vinyl Chloride	62	1.138	1.138	(0.272)	86586	13.4383	13.43
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	261228	45.0279	45.02
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	326152	52.2183	52.21
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	234731	47.1878	47.18
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	897824	48.7690	48.76
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	509006	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	750600	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.671	(1.000)	655178	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	341655	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092515.D
Date : 25-SEP-2019 15:50
Client ID: HS19090847-01MSD
Sample Info: HS19090847-01MSD;HS19090847-01MSD;3;;MSD
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092516.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092516.D
Lab Smp Id: HS19090860-03 Client Smp ID: HS19090860-03
Inj Date : 25-SEP-2019 16:14
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-03;HS19090860-03;;;
Misc Info : HS18090001;WATER;0;250;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 15
Dil Factor: 250.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	250.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.912	1.912	(0.457)	3856	0.84620	211.55(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	496229	76.3826	19095.64
38 Trichloroethene	130	5.214	5.214	(1.049)	362007	60.7617	15190.42
5 Vinyl Chloride	62	1.138	1.138	(0.272)	7059	1.05968	264.92(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	272710	45.4767	45.47
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	328337	51.9891	51.98
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	241114	46.8776	46.87
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	920669	49.4639	49.46
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	526245	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	777250	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	662410	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	325205	50.0000	

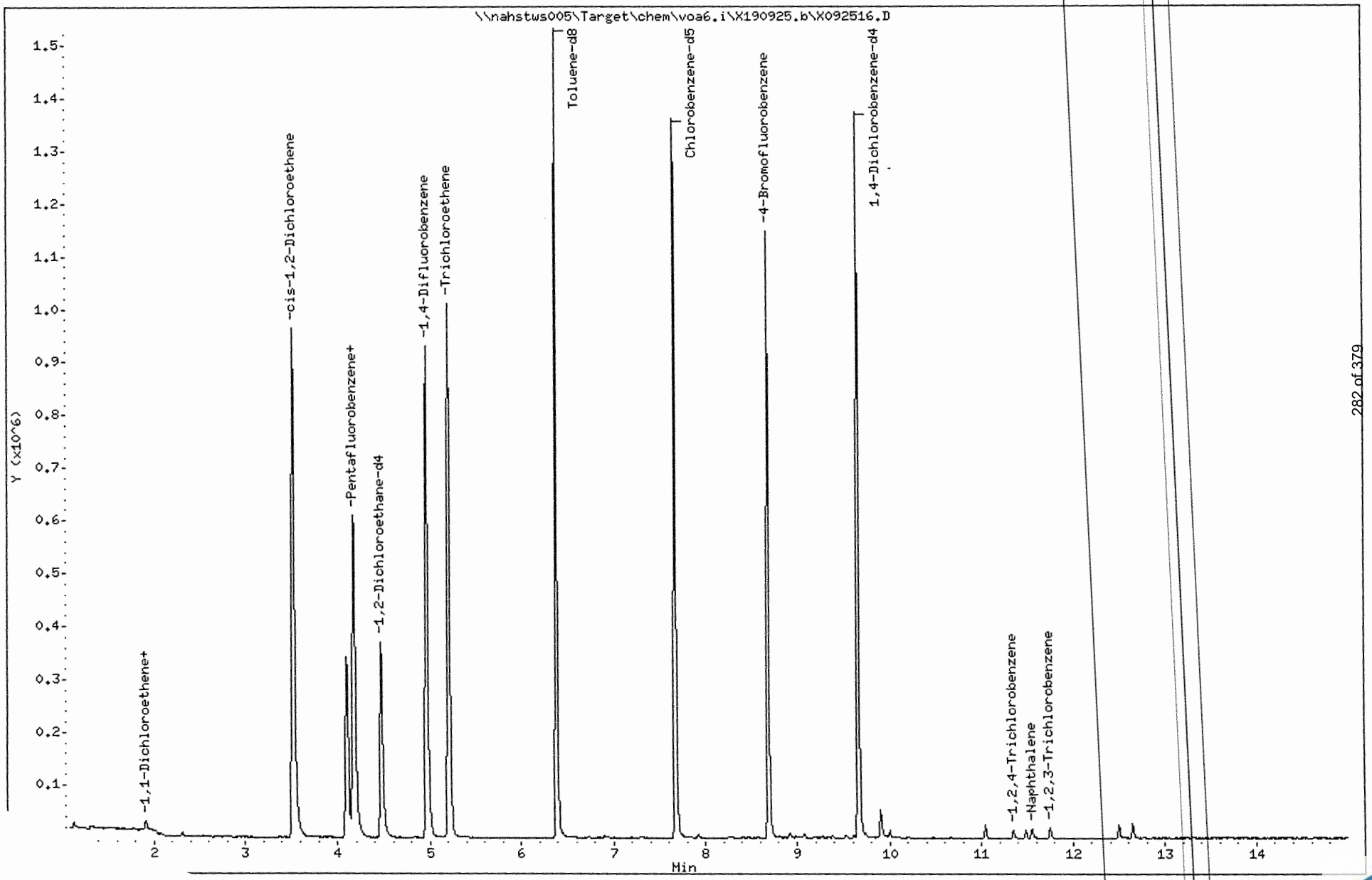
QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

01030041

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092516.D
Date : 25-SEP-2019 16:14
Client ID: HS19090860-03
Sample Info: HS19090860-03;HS19090860-03;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



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Date : 25-SEP-2019 16:14

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

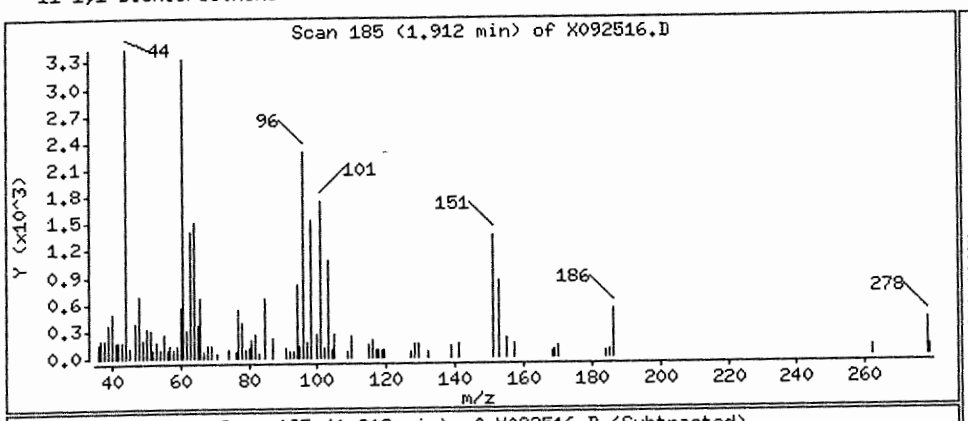
Operator: PC

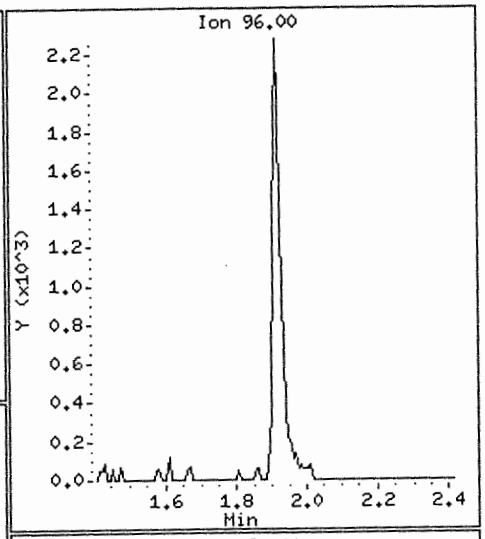
Column phase: DB624

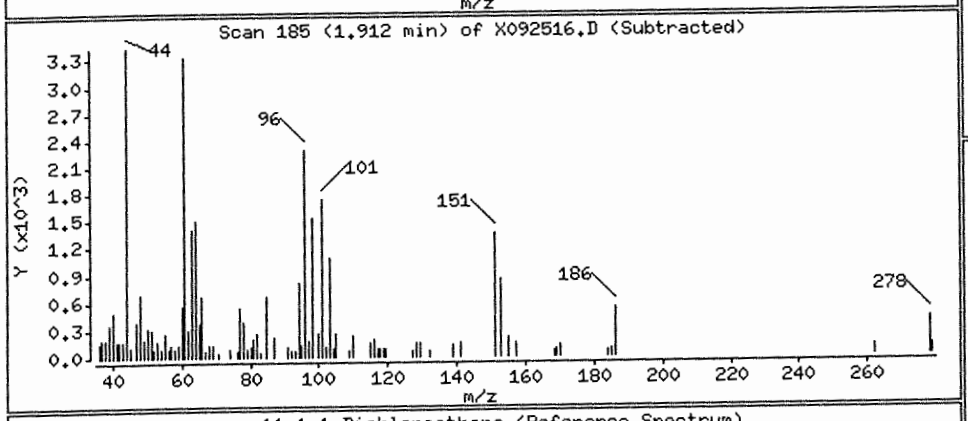
Column diameter: 0.18

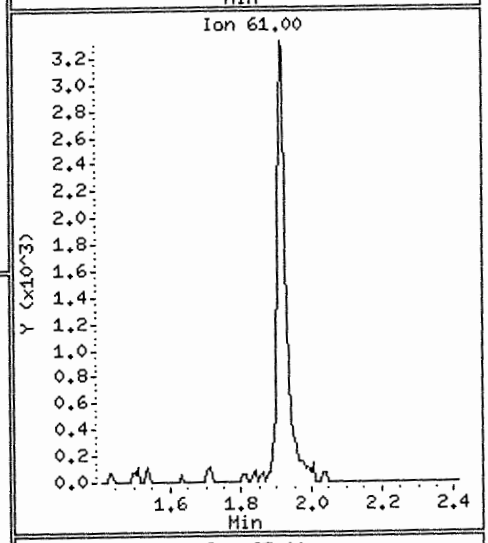
11 1,1-Dichloroethene

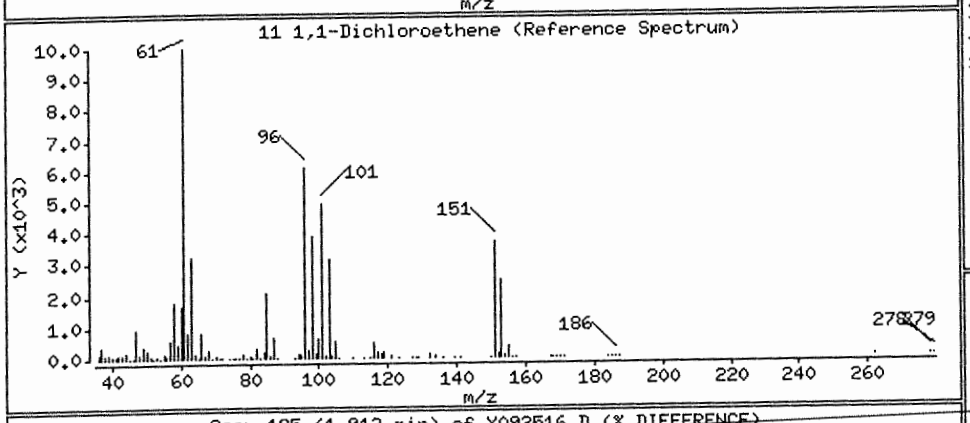
Concentration: 211.55 ug/l

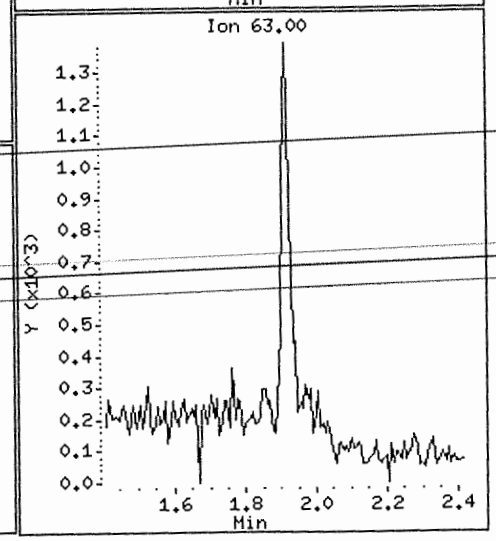


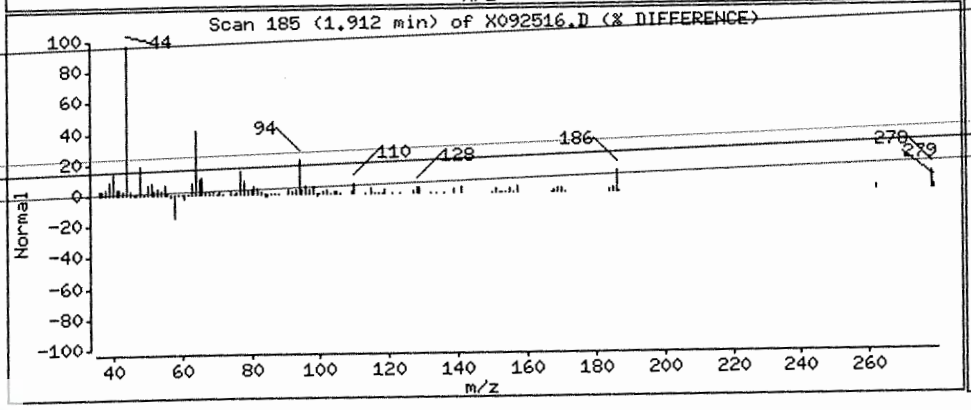












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Date : 25-SEP-2019 16:14

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

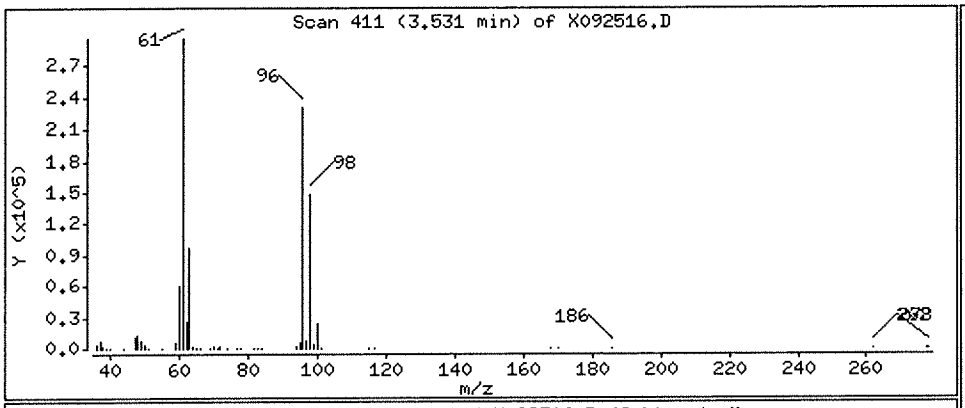
Operator: PC

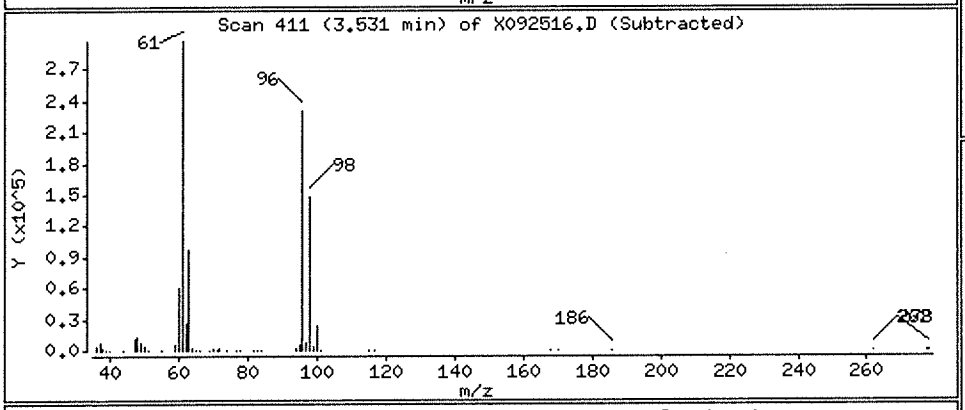
Column phase: DB624

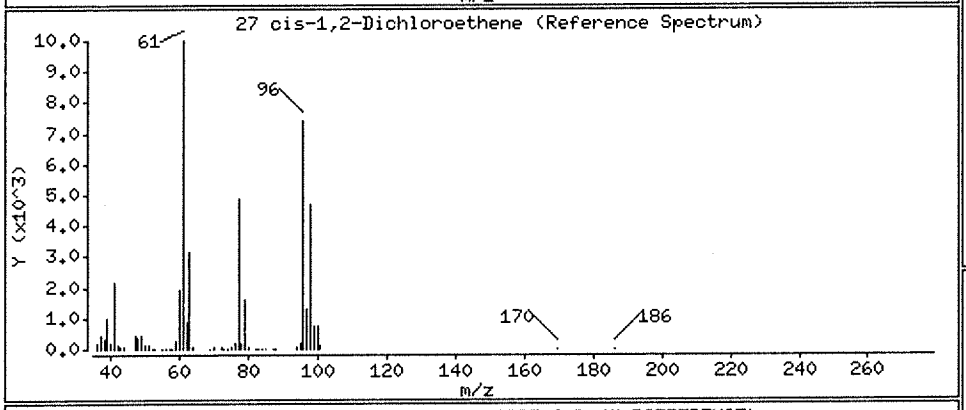
Column diameter: 0.18

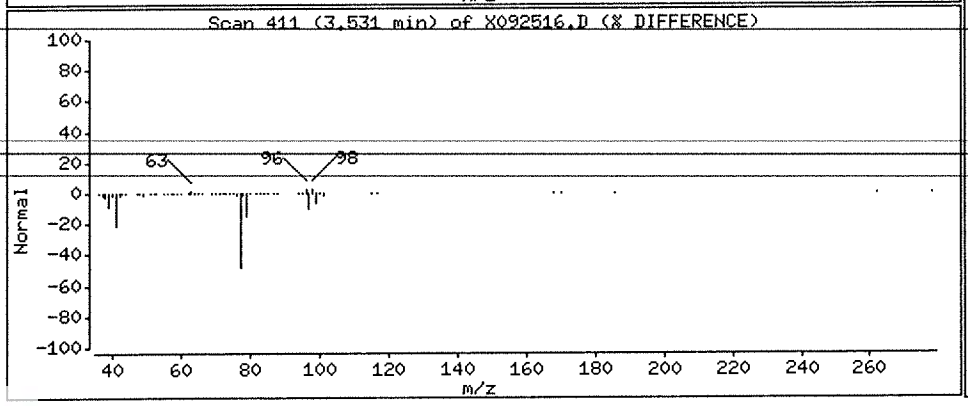
27 cis-1,2-Dichloroethene

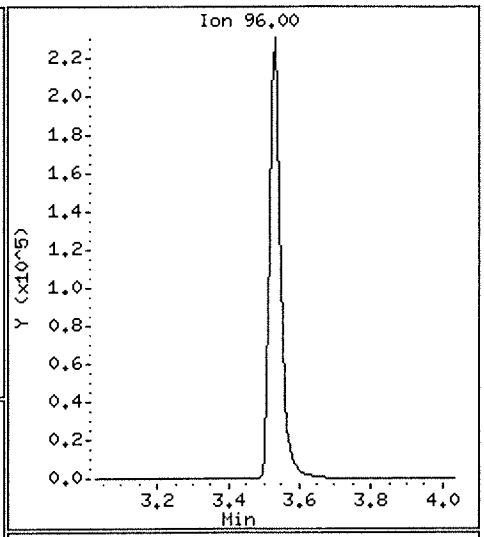
Concentration: 19095.64 ug/l

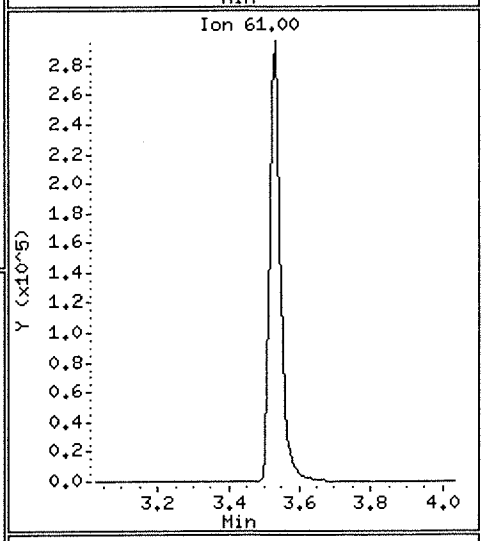


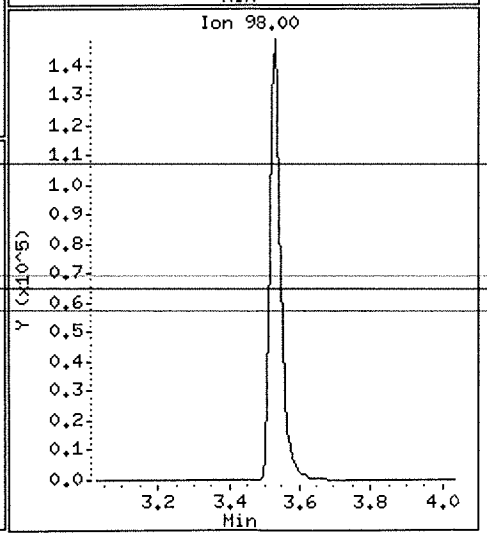












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Date : 25-SEP-2019 16:14

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

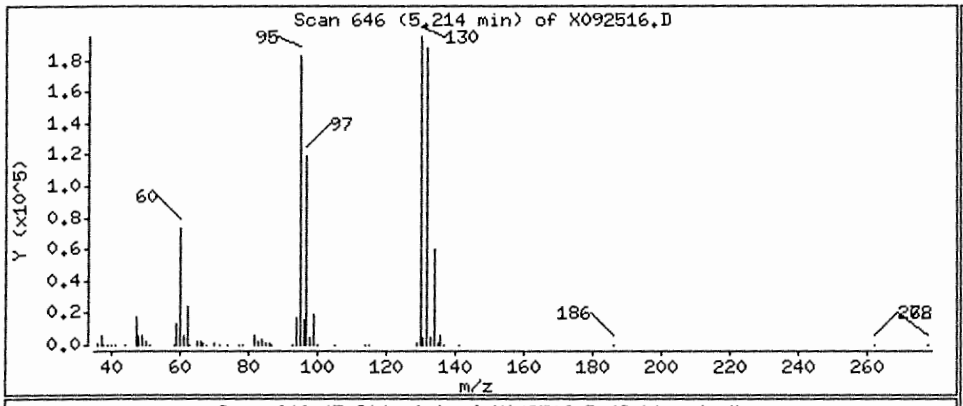
Operator: PC

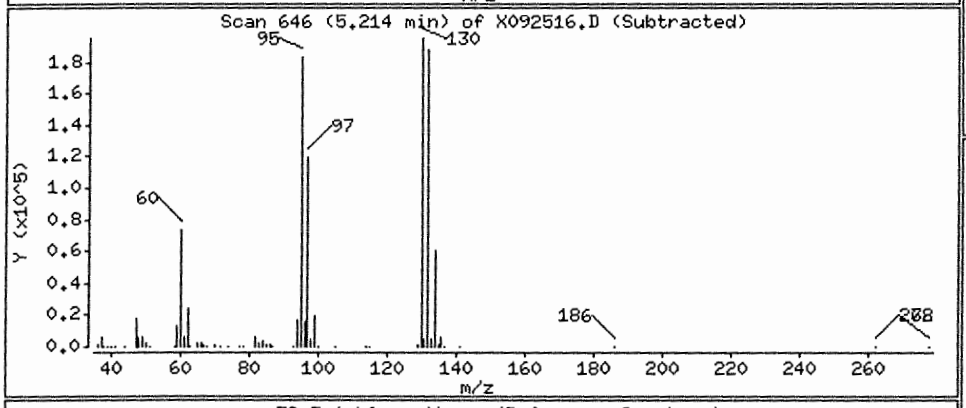
Column phase: DB624

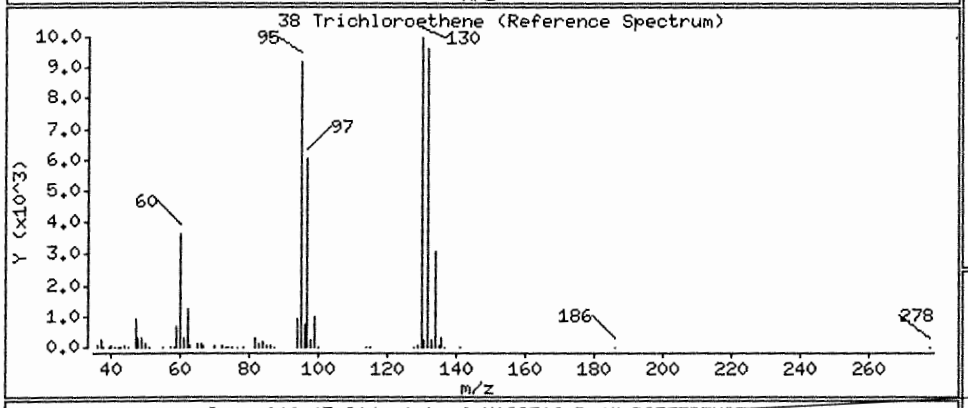
Column diameter: 0.18

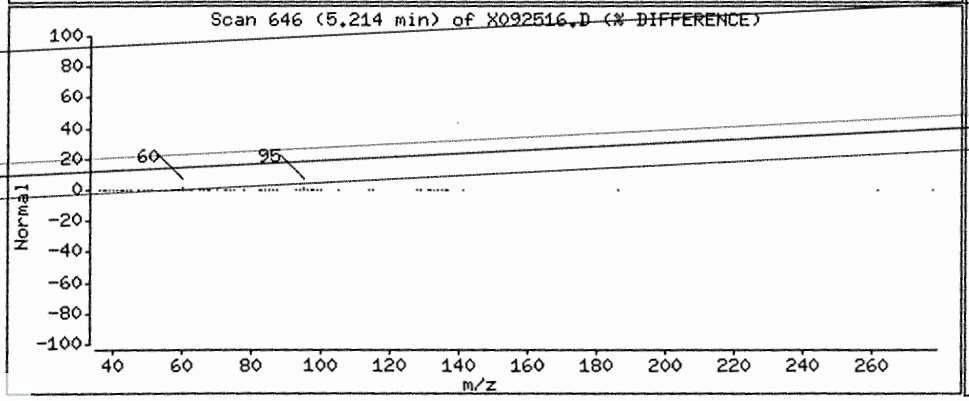
38 Trichloroethene

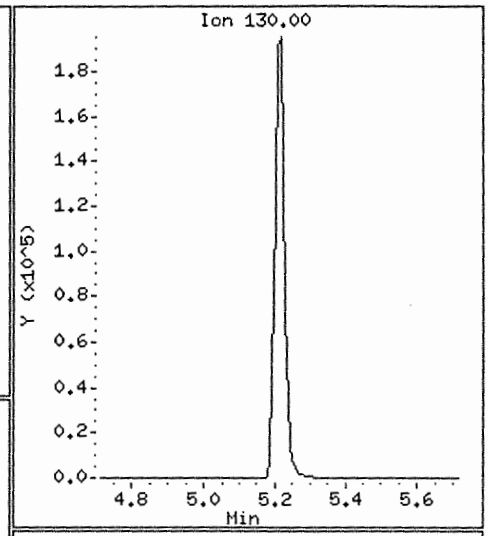
Concentration: 15190.42 ug/l

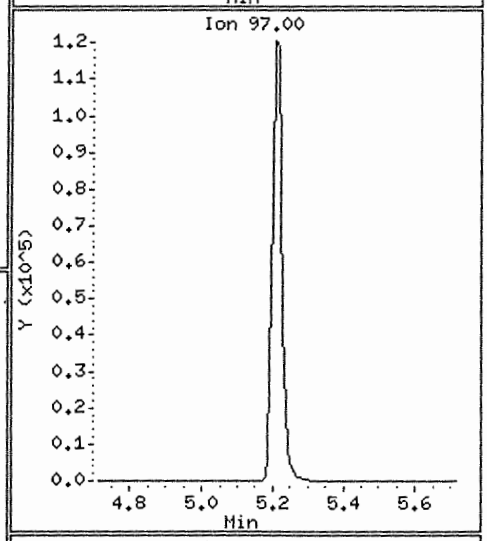


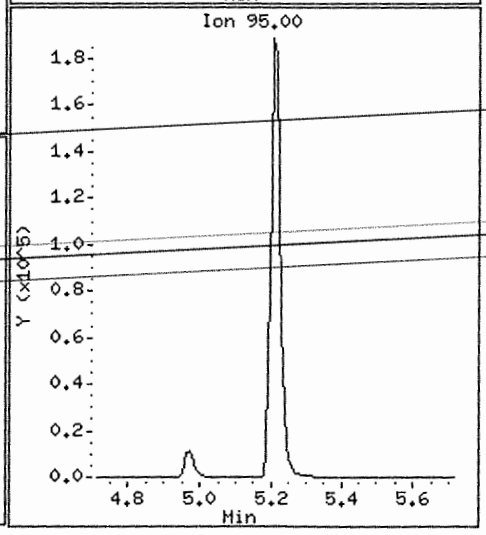












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092516.D

Date : 25-SEP-2019 16:14

Client ID: HS19090860-03

Instrument: voa6.i

Sample Info: HS19090860-03;HS19090860-03;;;

Purge Volume: 5.0

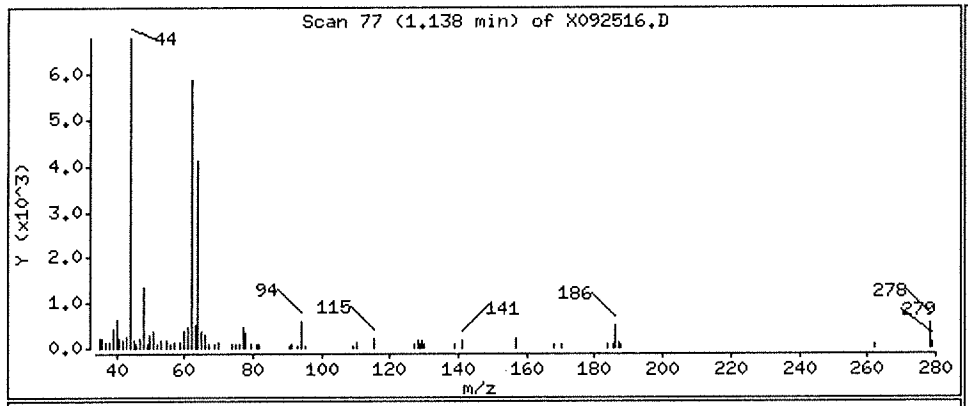
Operator: PC

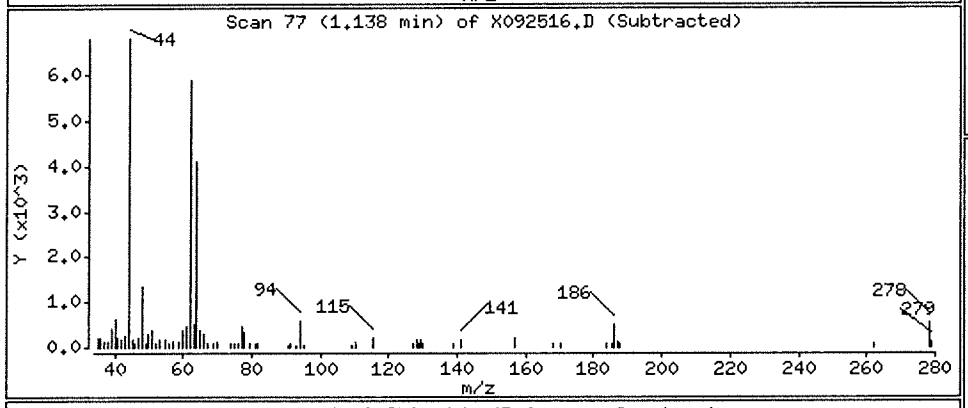
Column phase: DB624

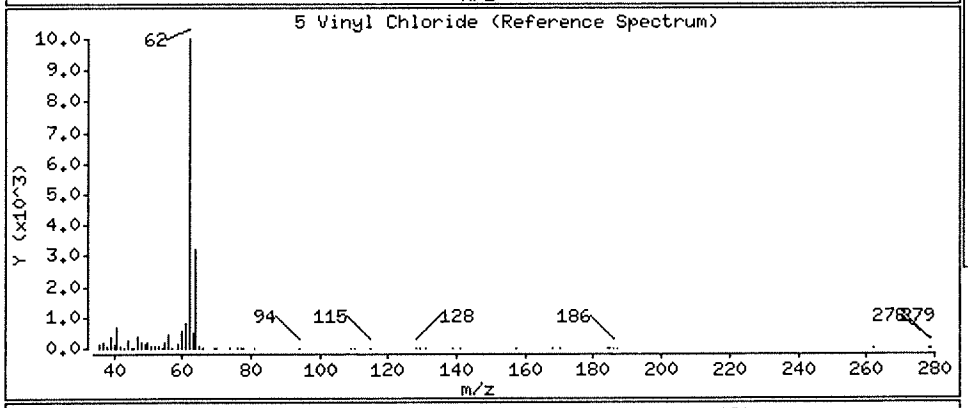
Column diameter: 0.18

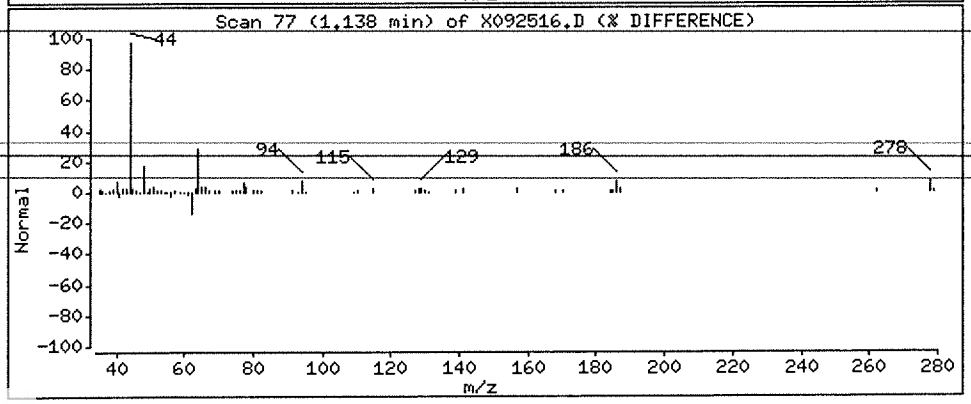
5 Vinyl Chloride

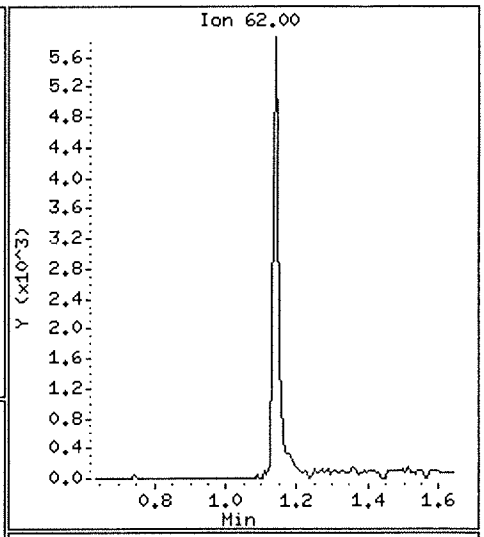
Concentration: 264.92 ug/l

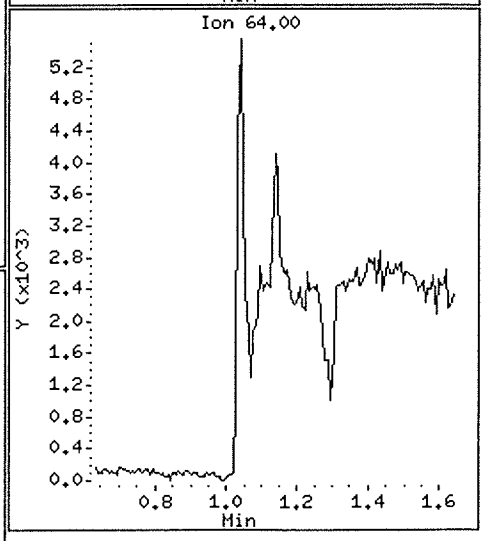












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092517.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092517.D
Lab Smp Id: HS19090860-04 Client Smp ID: HS19090860-04
Inj Date : 25-SEP-2019 16:38
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-04;HS19090860-04;;;
Misc Info : HS18090001;WATER;0;5;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 16
Dil Factor: 5.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

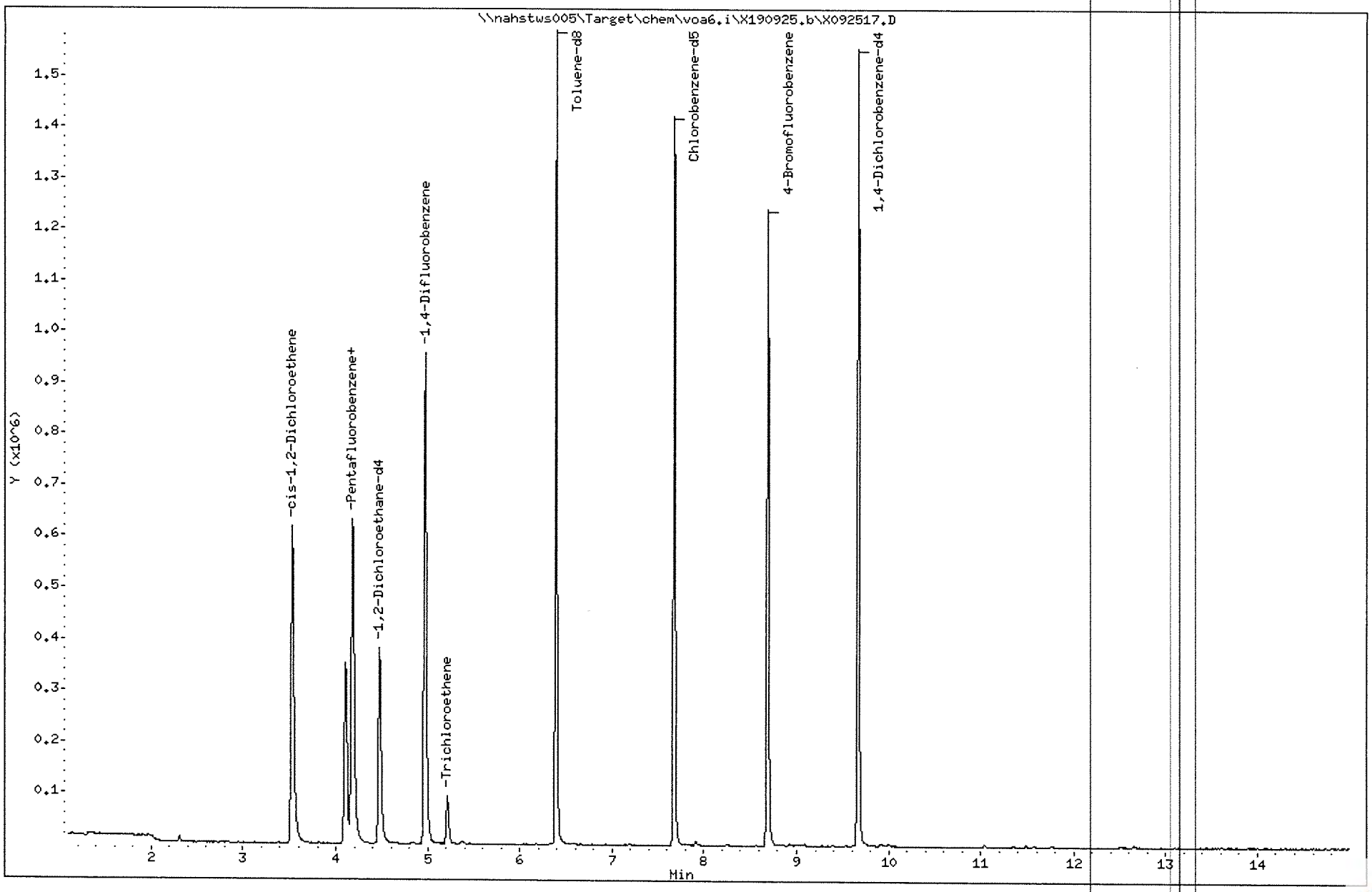
Name	Value	Description
DF	5.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	320503	47.9048	239.52
38 Trichloroethene	130	5.214	5.214	(1.049)	32832	5.33088	26.65
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	279845	45.3113	45.31
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	355399	53.8066	53.80
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	248425	46.9004	46.90
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	950318	48.7809	48.78
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	541943	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	803475	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	693315	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	372297	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092517.D
Date : 25-SEP-2019 16:38
Client ID: HS19090860-04
Sample Info: HS19090860-04;HS19090860-04;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092517.D

Date : 25-SEP-2019 16:38

Client ID: HS19090860-04

Instrument: voa6.i

Sample Info: HS19090860-04;HS19090860-04;;;

Purge Volume: 5.0

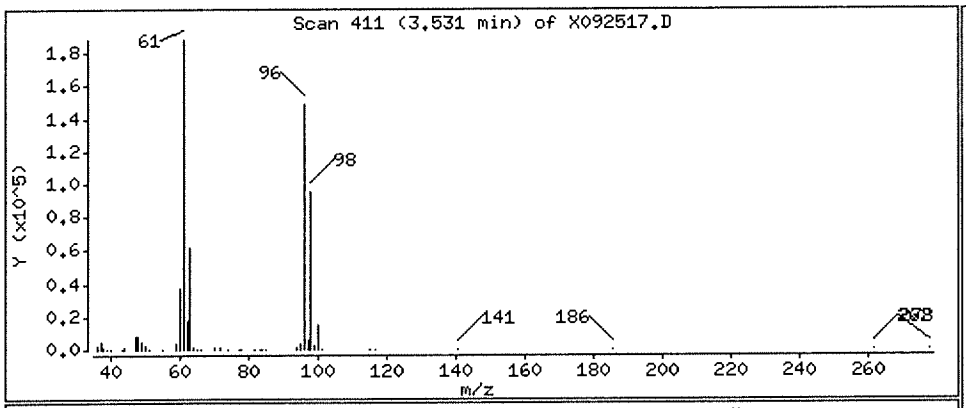
Operator: PC

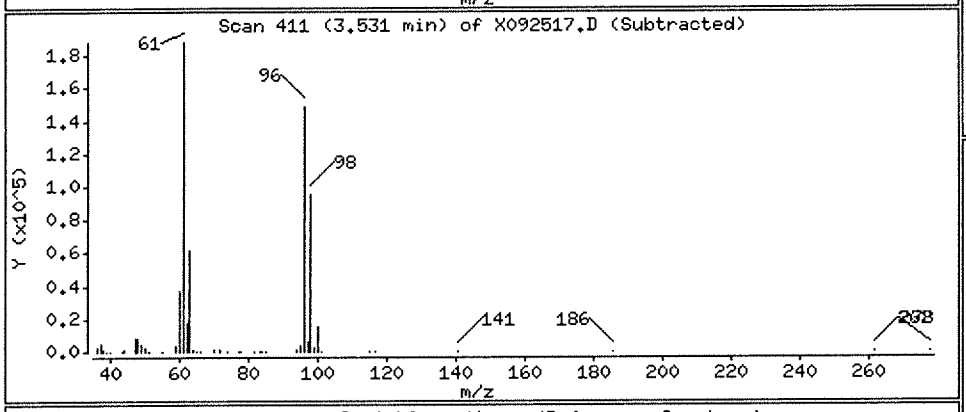
Column phase: DB624

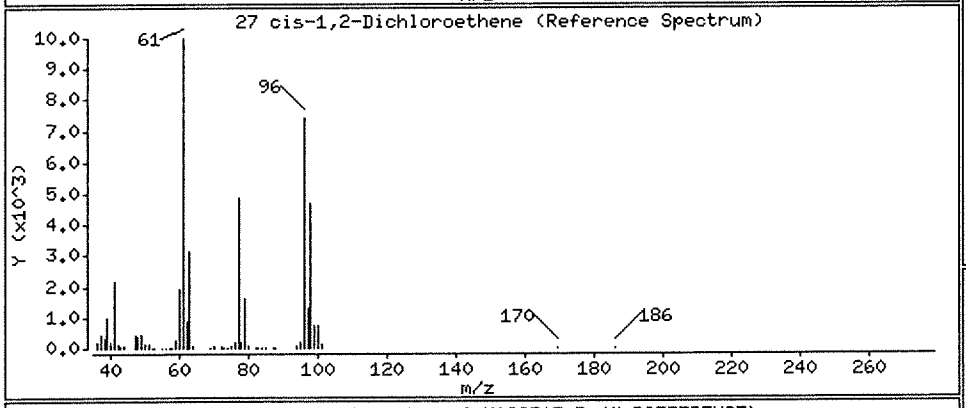
Column diameter: 0.18

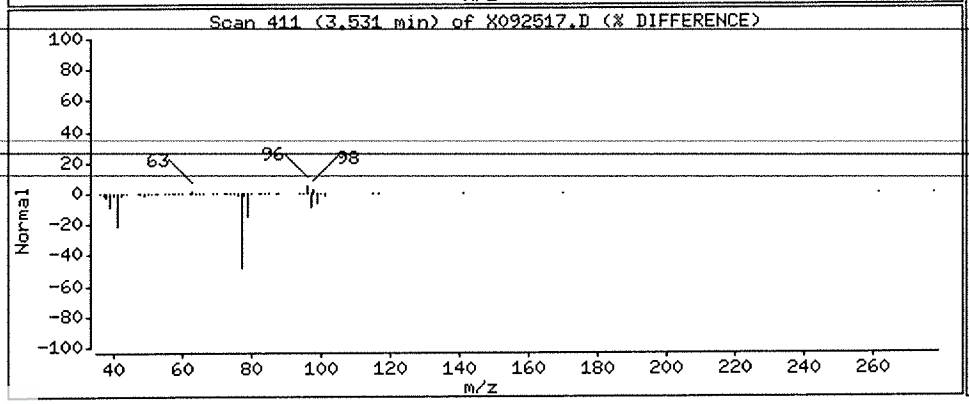
27 cis-1,2-Dichloroethene

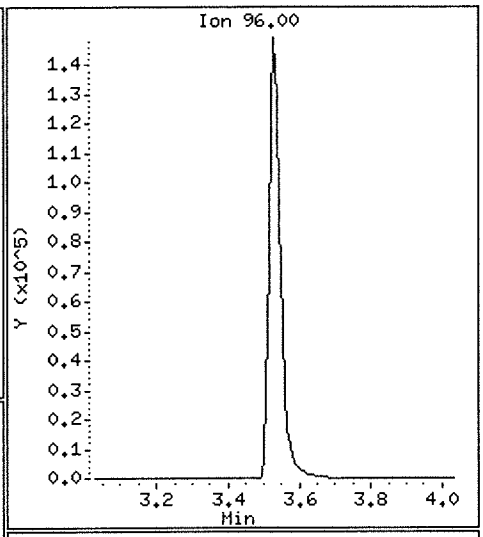
Concentration: 239.52 ug/l

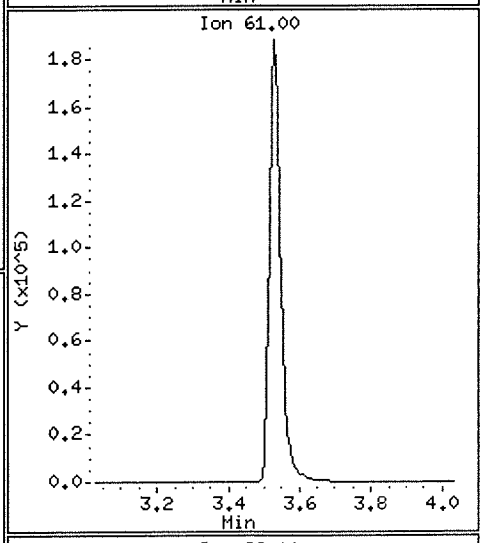


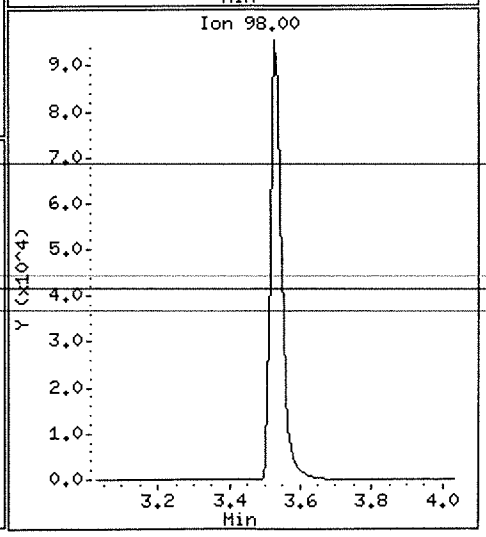












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092517.D

Date : 25-SEP-2019 16:38

Client ID: HS19090860-04

Instrument: voa6.i

Sample Info: HS19090860-04;HS19090860-04;;;

Purge Volume: 5.0

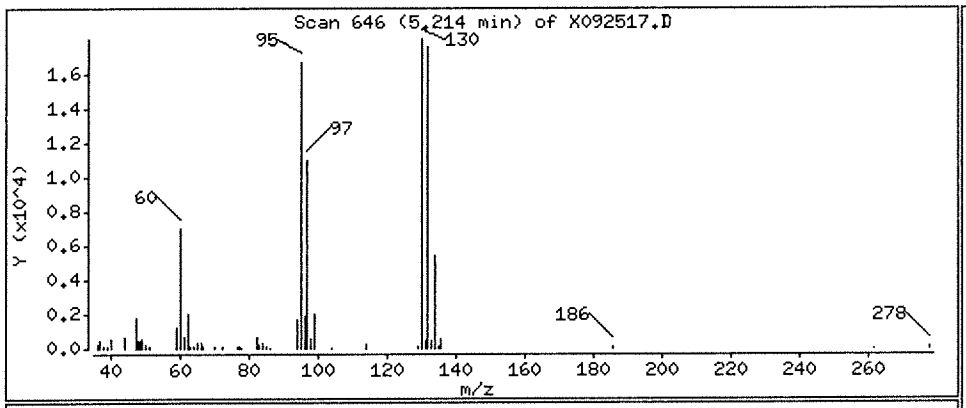
Operator: PC

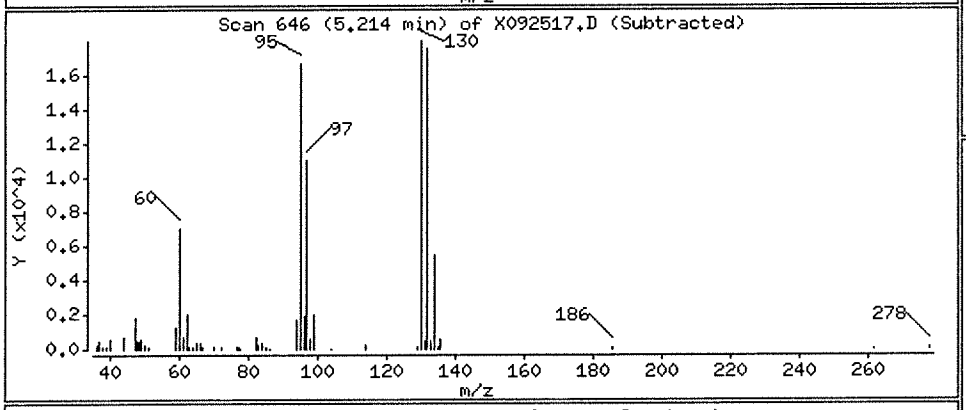
Column phase: DB624

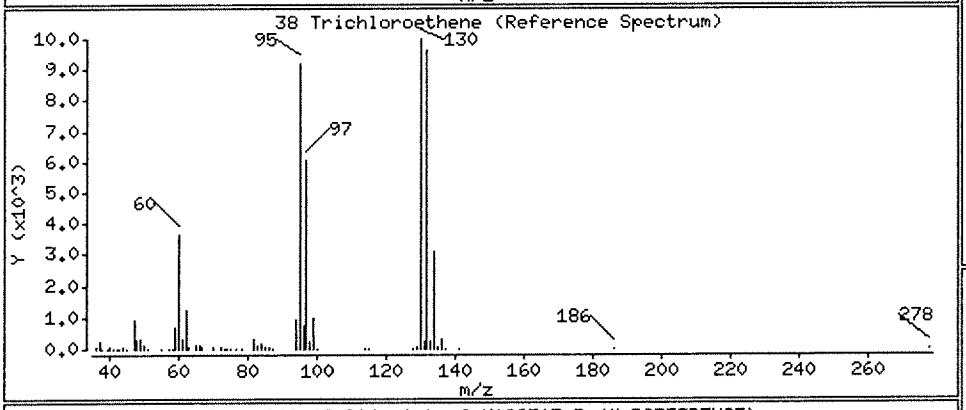
Column diameter: 0.18

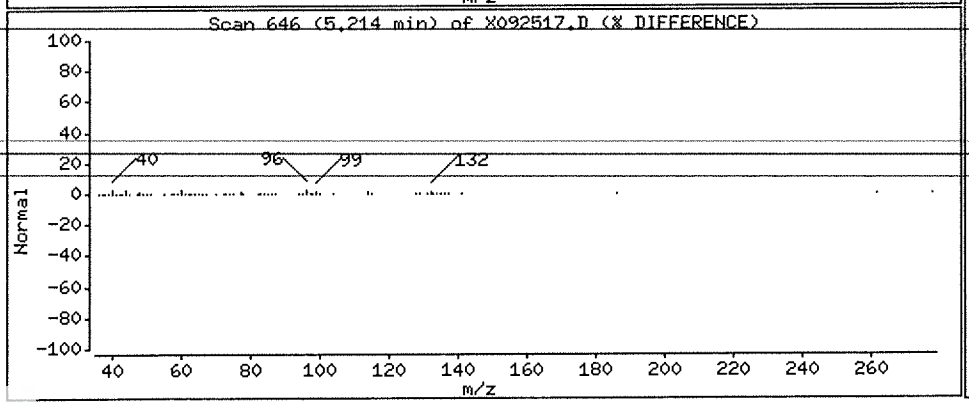
38 Trichloroethene

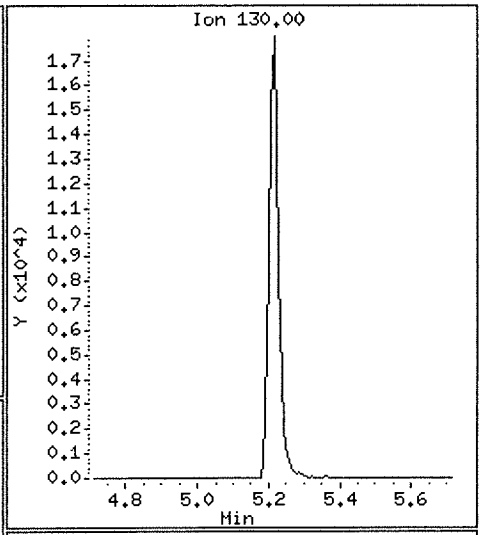
Concentration: 26.65 ug/l

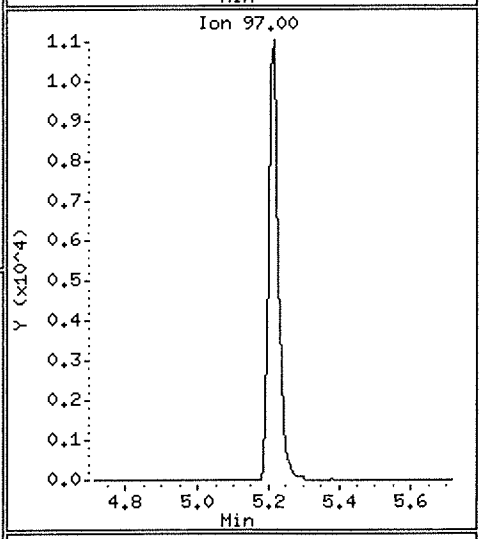


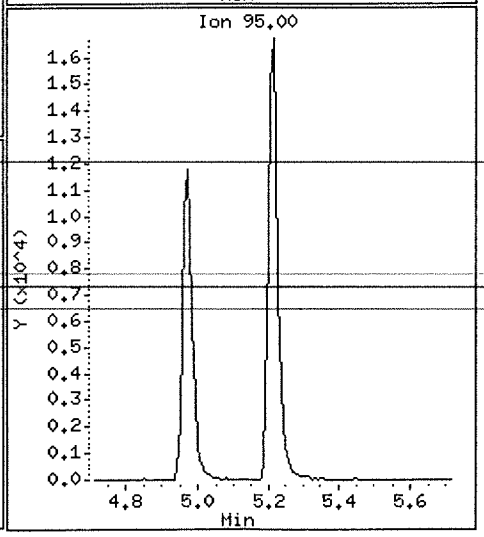












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092518.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092518.D
Lab Smp Id: HS19090860-13 Client Smp ID: HS19090860-13
Inj Date : 25-SEP-2019 17:02
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-13;HS19090860-13;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 17
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	279429	45.3703	45.37
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	327649	51.0805	51.08
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	245708	46.5086	46.50
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	939702	49.7282	49.72
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	540449	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	790174	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	672511	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	344841	50.0000	

01030051

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092518.D

Date : 25-SEP-2019 17:02

Client ID: HS19090860-13

Sample Info: HS19090860-13;HS19090860-13;;;

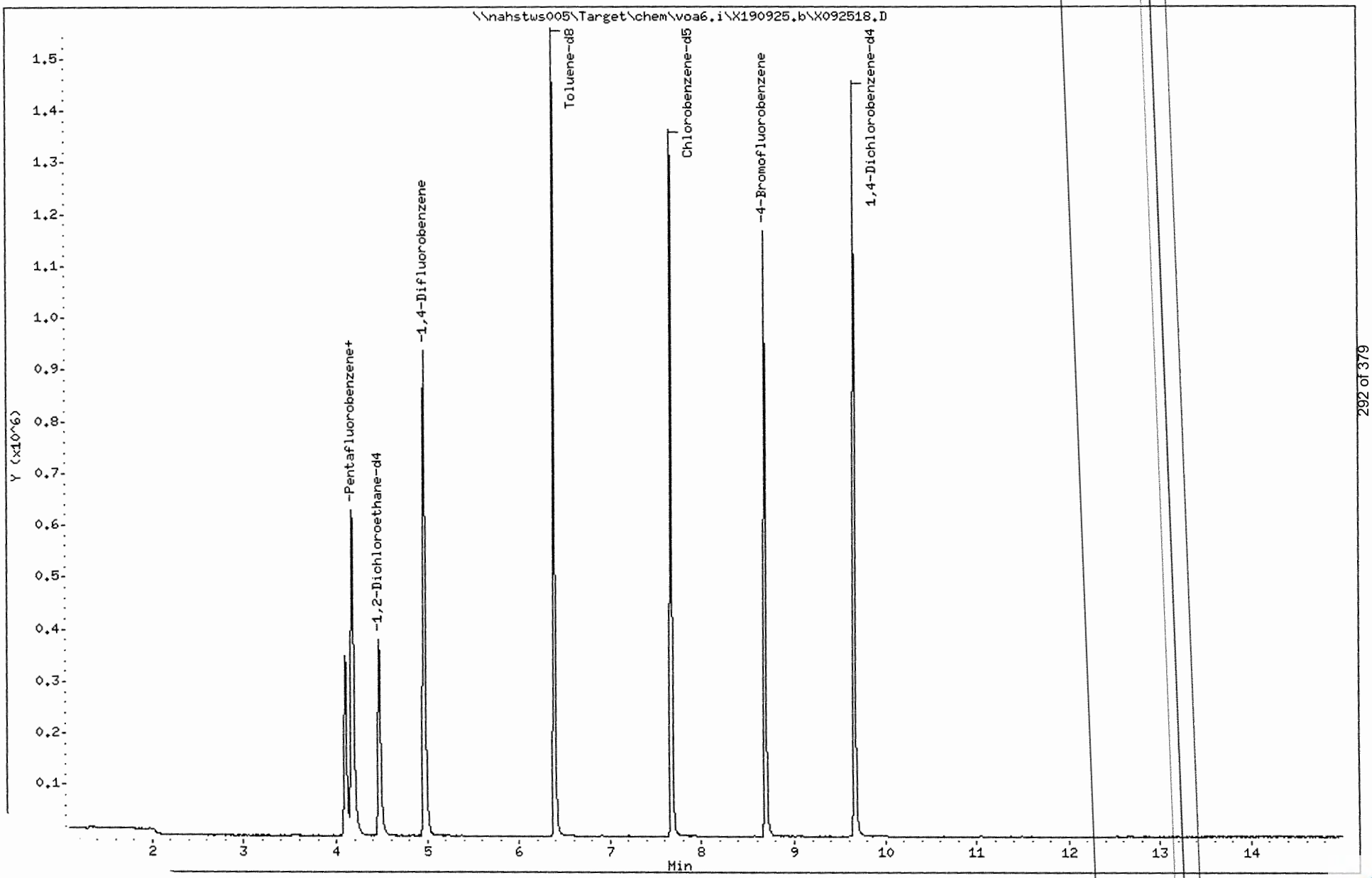
Purge Volume: 5.0

Column phase: DB624

Instrument: voa6.i

Operator: PC

Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092519.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092519.D
Lab Smp Id: HS19090860-14 Client Smp ID: HS19090860-14
Inj Date : 25-SEP-2019 17:26
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-14;HS19090860-14;;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 18
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

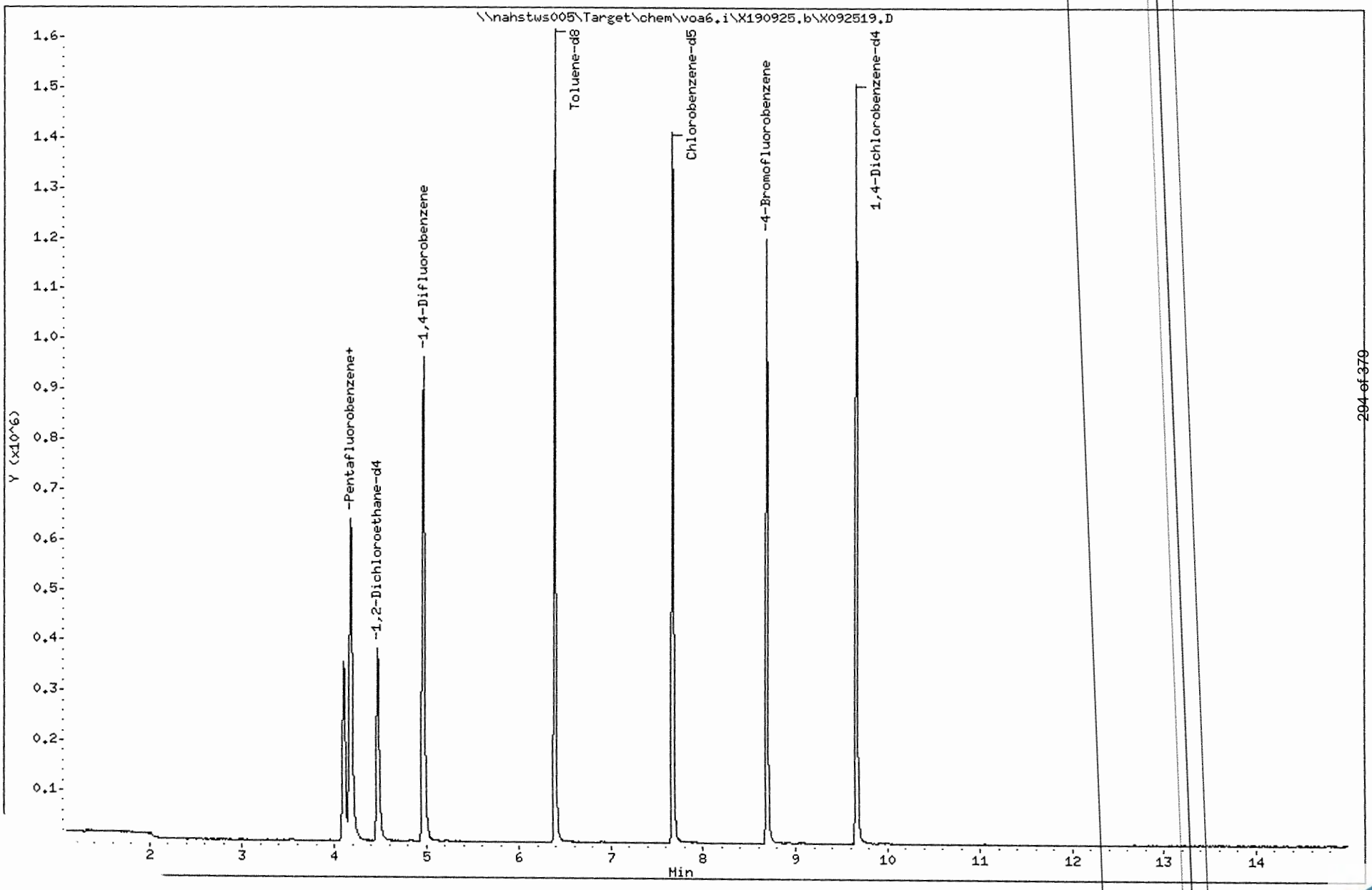
Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	283901	45.3085	45.30
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	341337	52.4833	52.48
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	249785	46.4729	46.47
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	956491	49.8907	49.89
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	549831	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	810611	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	682297	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	357046	50.0000	

01030053

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092519.D
Date : 25-SEP-2019 17:26
Client ID: HS19090860-14
Sample Info: HS19090860-14;HS19090860-14;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D
Lab Smp Id: HS19090860-09 Client Smp ID: HS19090860-09
Inj Date : 25-SEP-2019 18:38
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-09;HS19090860-09;;;
Misc Info : HS18090001;WATER;0;5;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 21
Dil Factor: 5.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	5.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

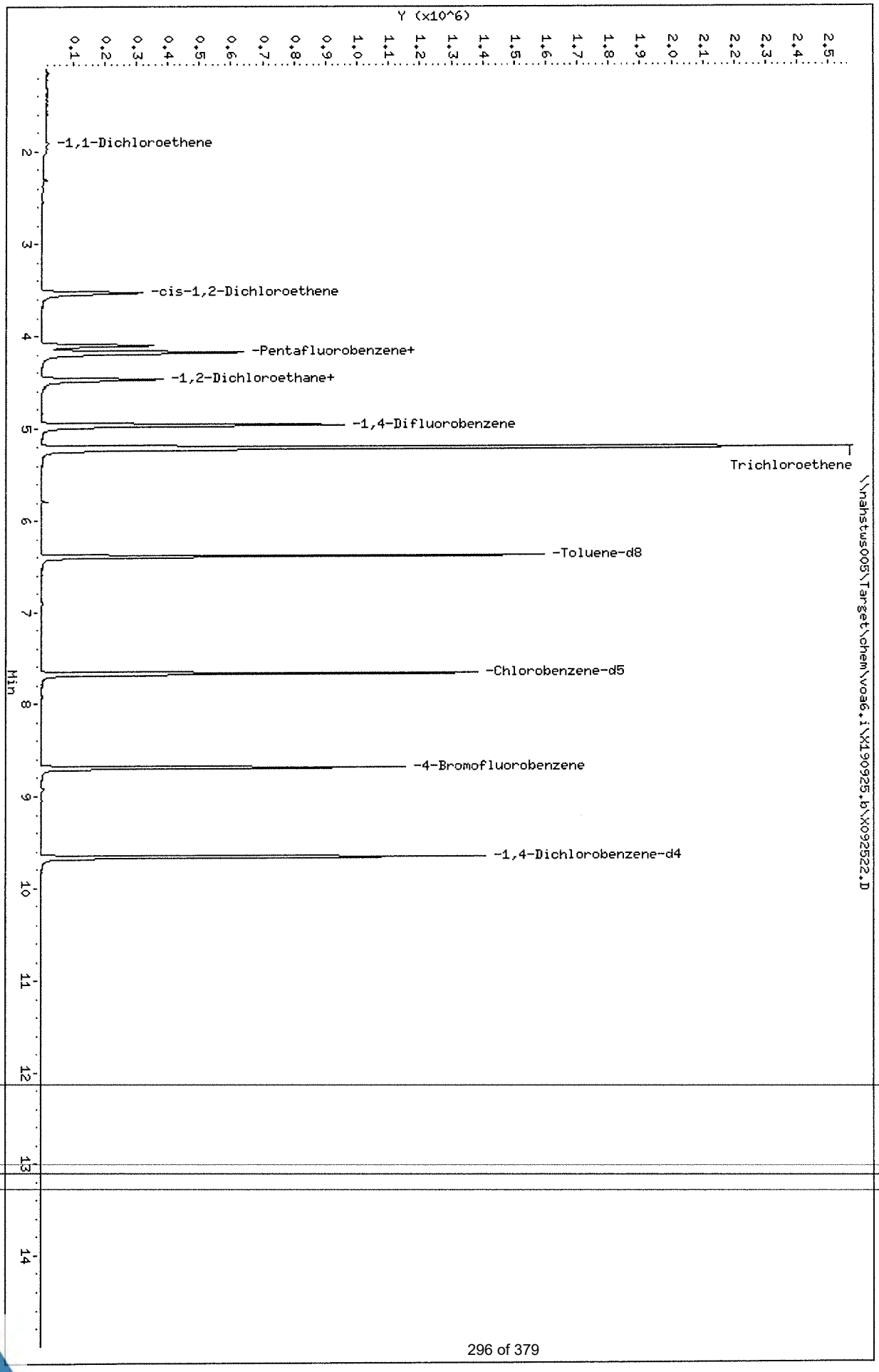
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.911	1.912	(0.457)	2768	0.58173	2.90(a)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	6358	0.84722	4.23(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	169381	24.9685	124.84
38 Trichloroethene	130	5.214	5.214	(1.049)	915769	148.231	741.15
5 Vinyl Chloride	62	1.138	1.138	(0.272)	3801	0.54644	2.73(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	282911	45.1745	45.17
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	335998	51.9420	51.94
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	248985	46.3493	46.34
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	941797	49.4015	49.40
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	549505	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	805973	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	678467	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	347817	50.0000	

QC Flag Legend

a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

Data File: \\nahstus005\Target\chem\voa6.i\X190925.b\X092522.D
Date : 25-SEP-2019 18:38
Client ID: HS19090860-09
Sample Info: HS19090860-09;HS19090860-09;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D

Date : 25-SEP-2019 18:38

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

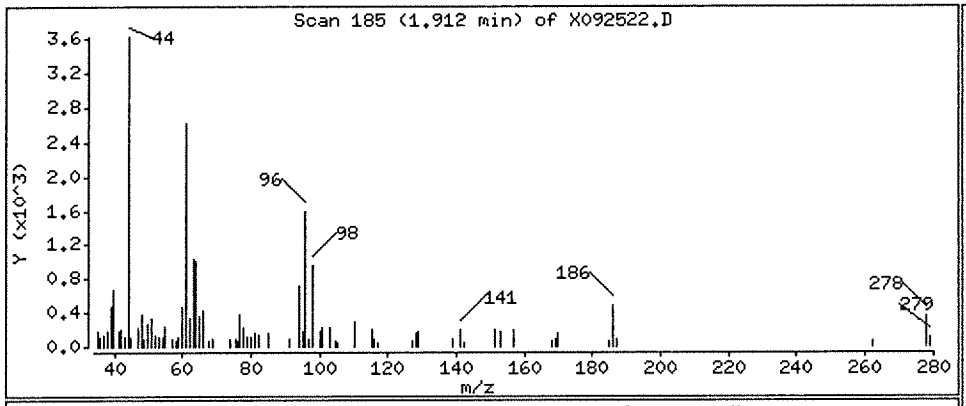
Operator: PC

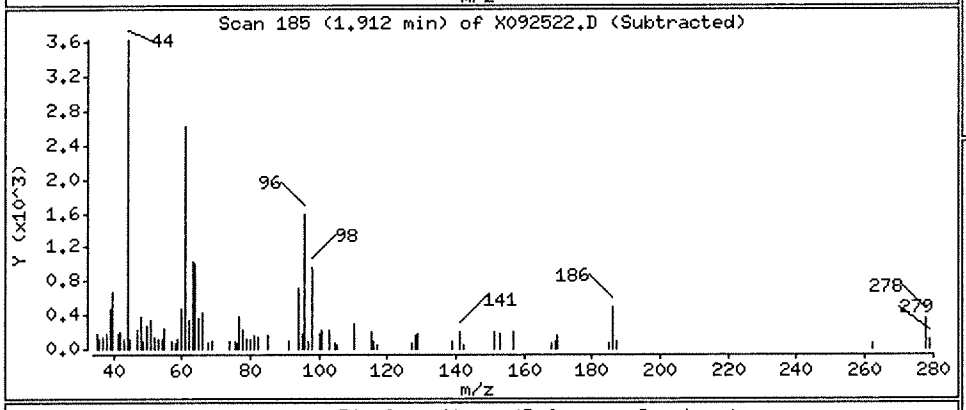
Column phase: DB624

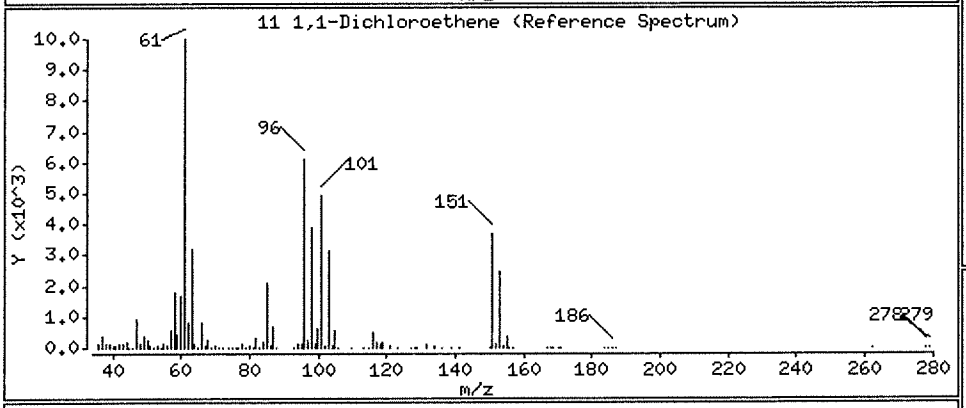
Column diameter: 0.18

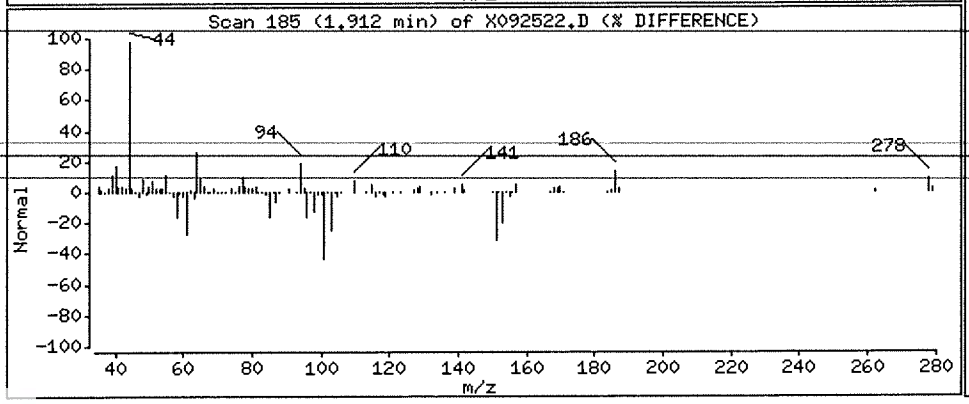
11 1,1-Dichloroethene

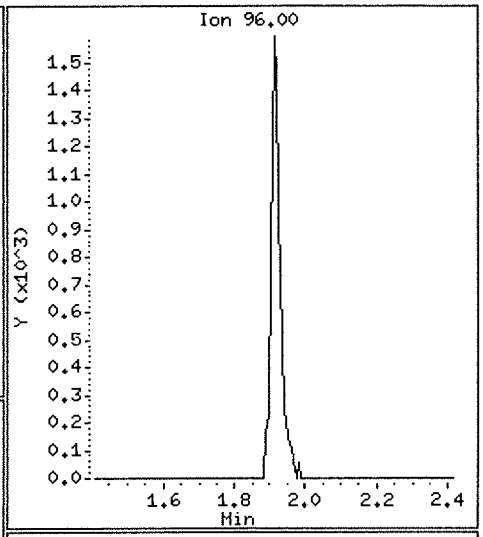
Concentration: 2.90 ug/l

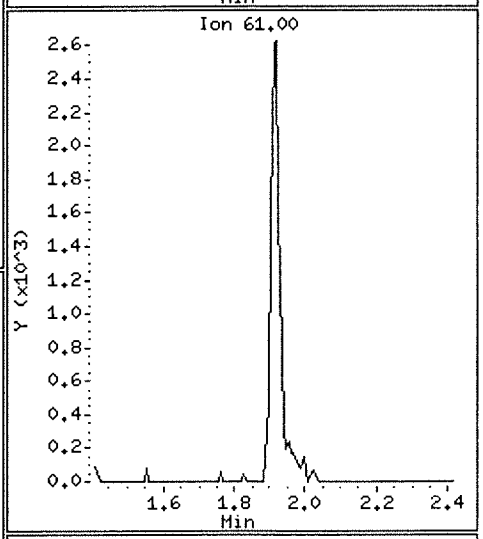


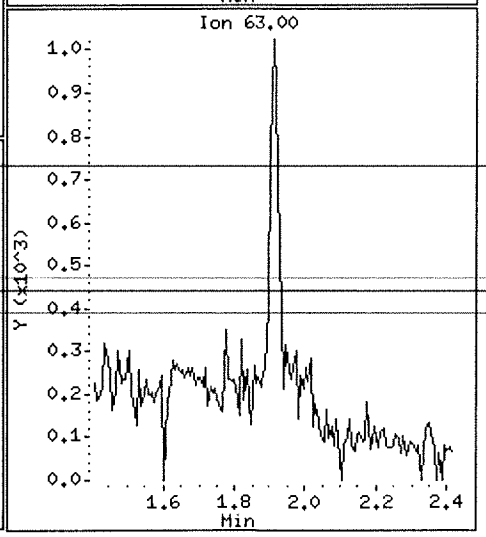












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D

Date : 25-SEP-2019 18:38

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

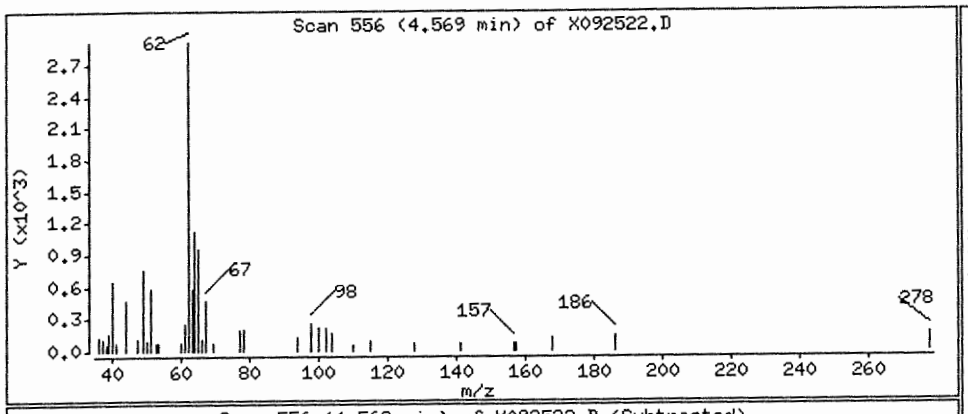
Operator: PC

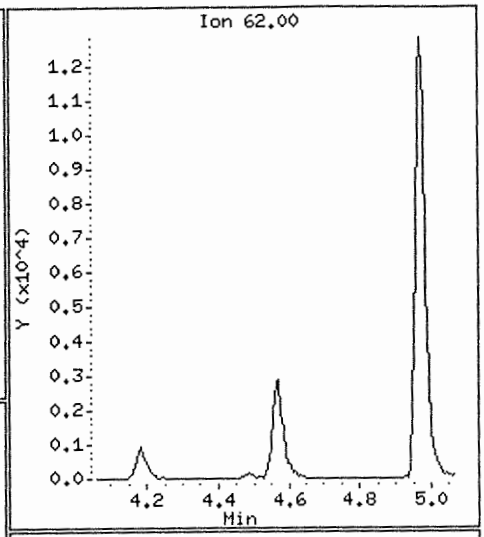
Column phase: DB624

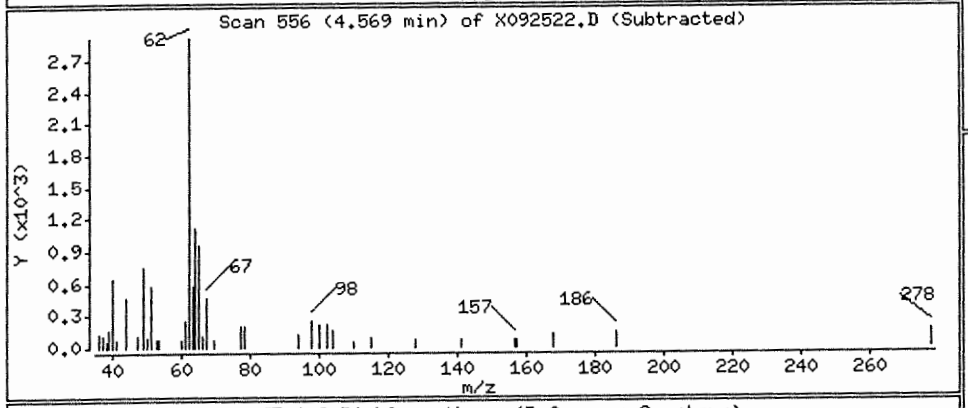
Column diameter: 0.18

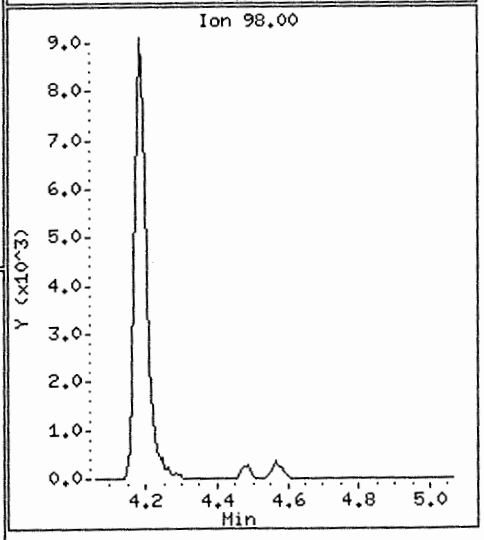
33 1,2-Dichloroethane

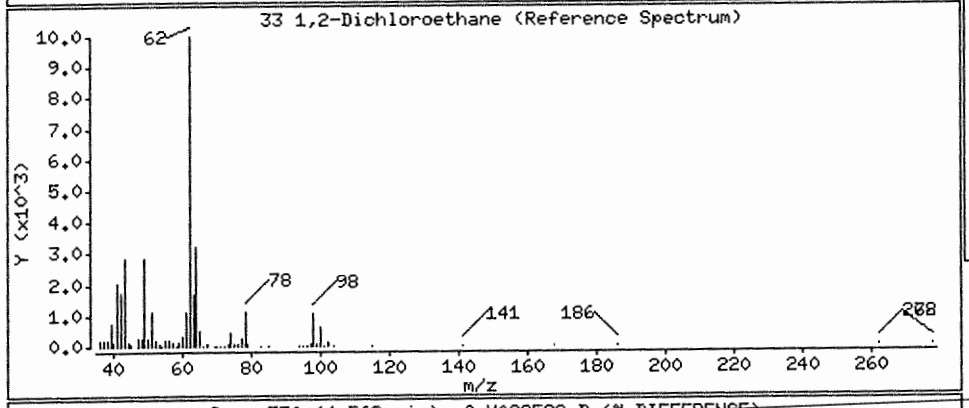
Concentration: 4.23 ug/l

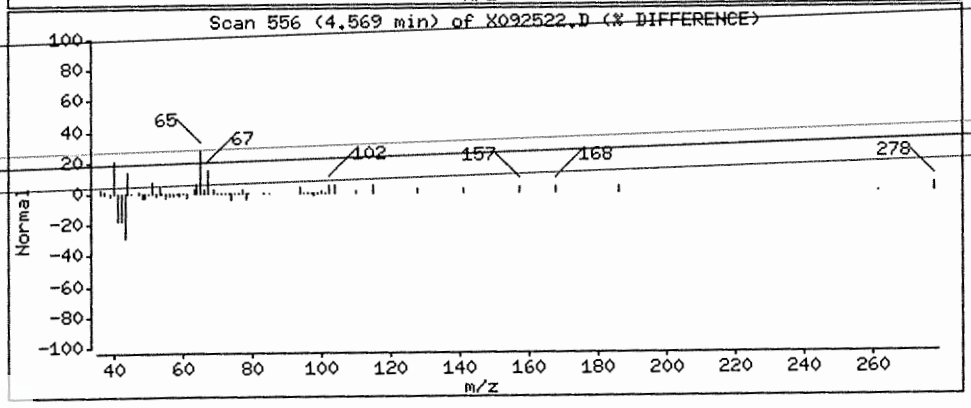












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D

Date : 25-SEP-2019 18:38

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

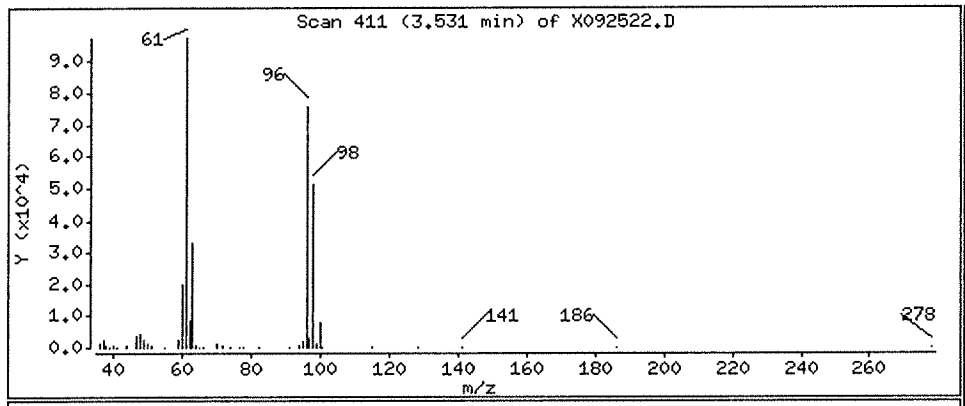
Operator: PC

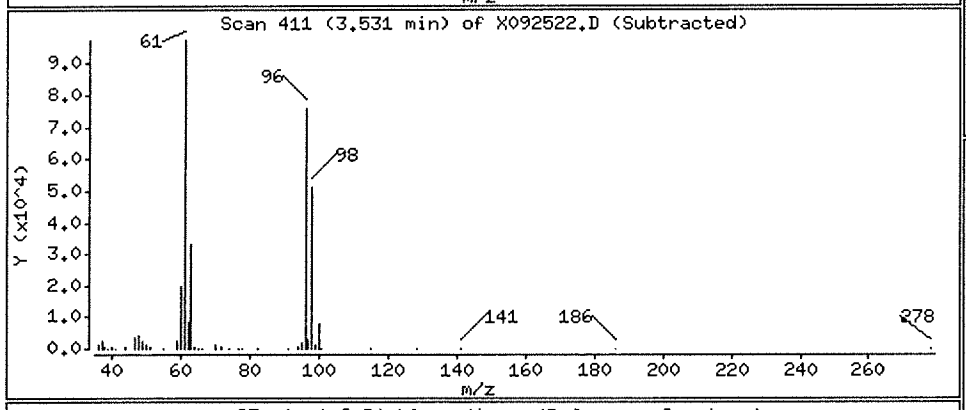
Column phase: DB624

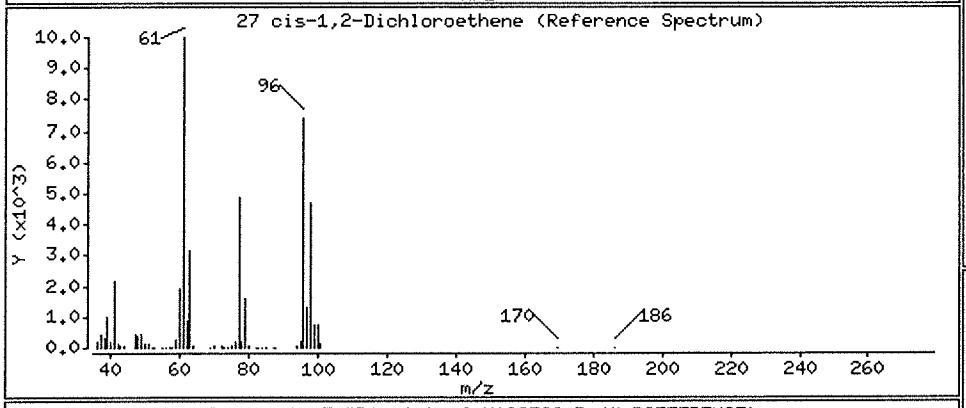
Column diameter: 0.18

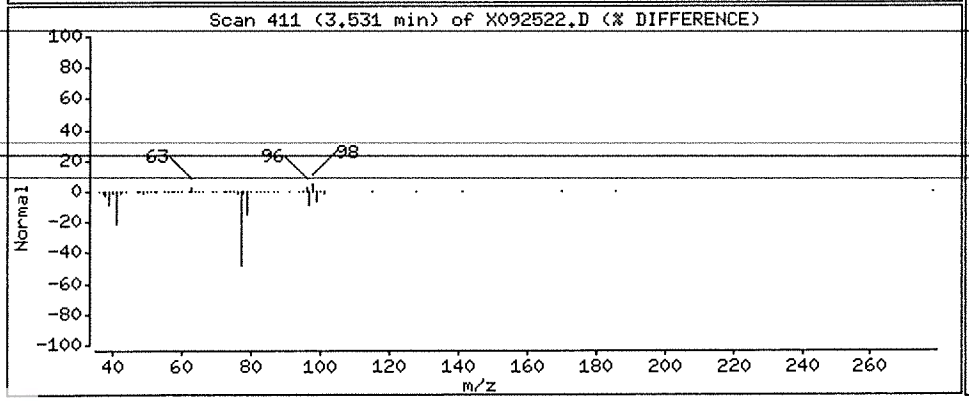
27 cis-1,2-Dichloroethene

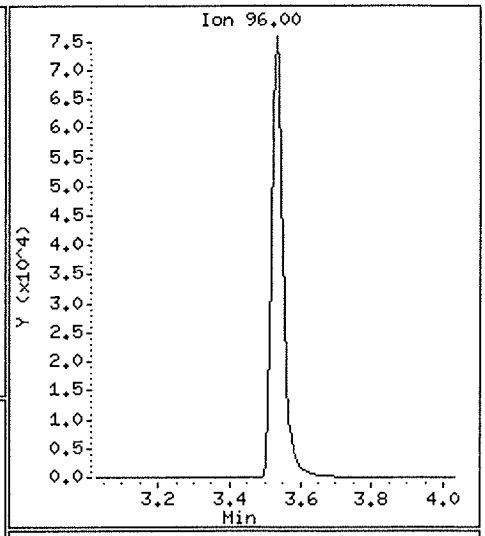
Concentration: 124.84 ug/l

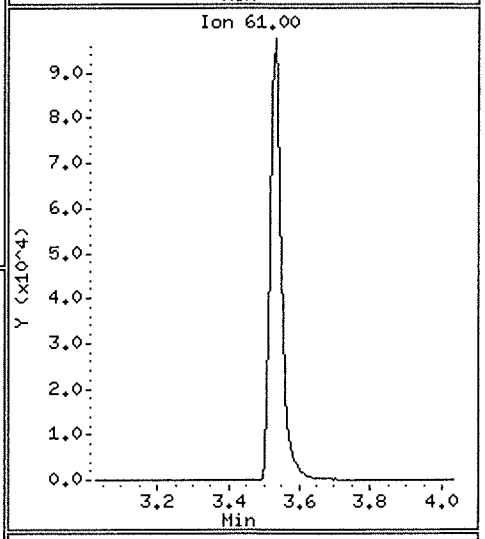


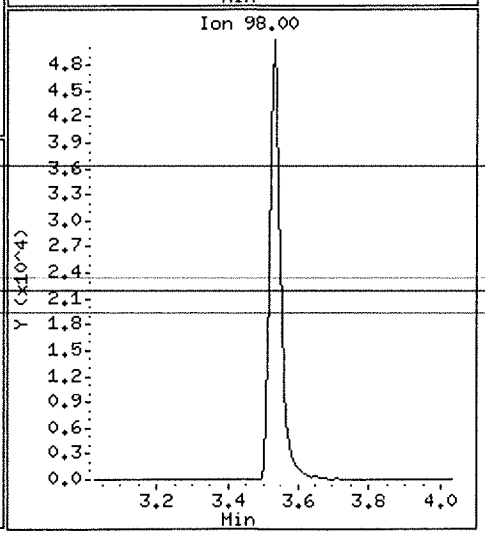












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D Page 6

Date : 25-SEP-2019 18:38

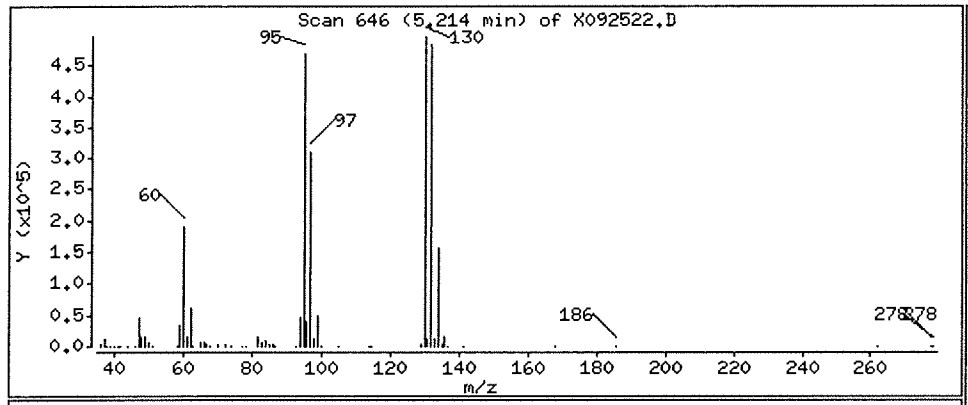
Client ID: HS19090860-09 Instrument: voa6.i

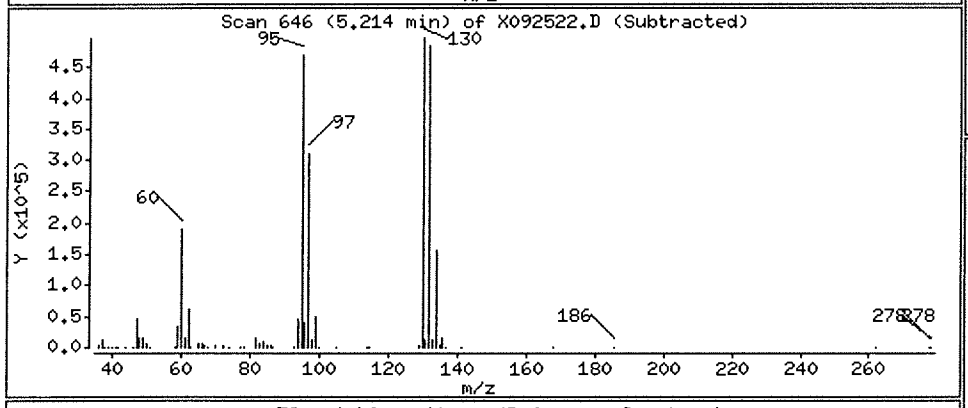
Sample Info: HS19090860-09;HS19090860-09;;;

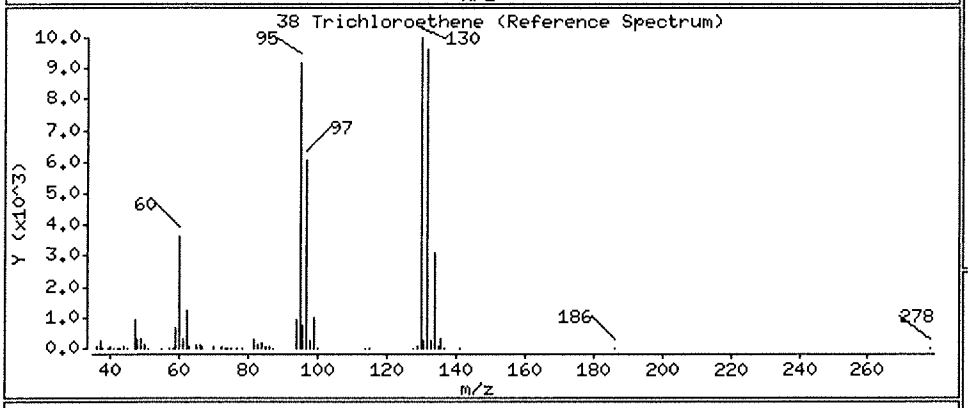
Purge Volume: 5.0 Operator: PC

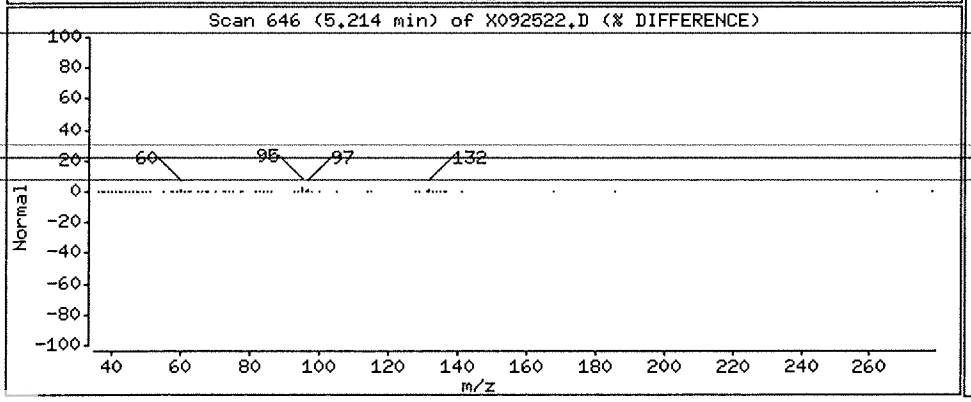
Column phase: DB624 Column diameter: 0.18

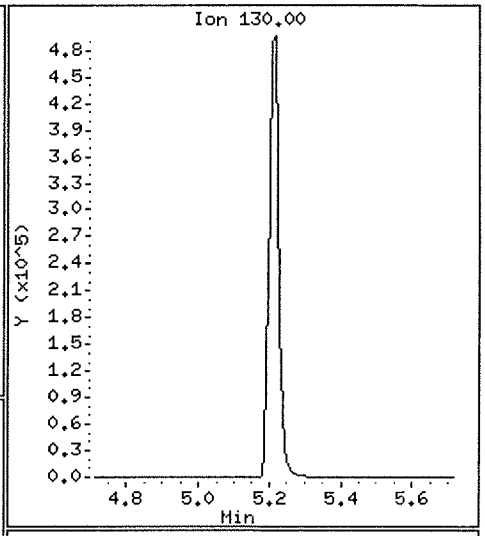
38 Trichloroethene Concentration: 741.15 ug/l

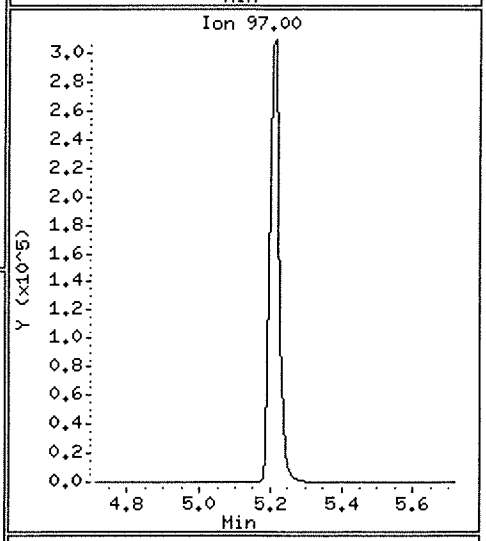


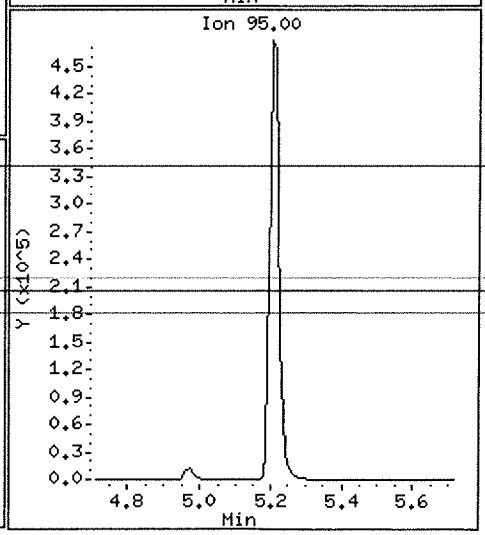












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092522.D

Date : 25-SEP-2019 18:38

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

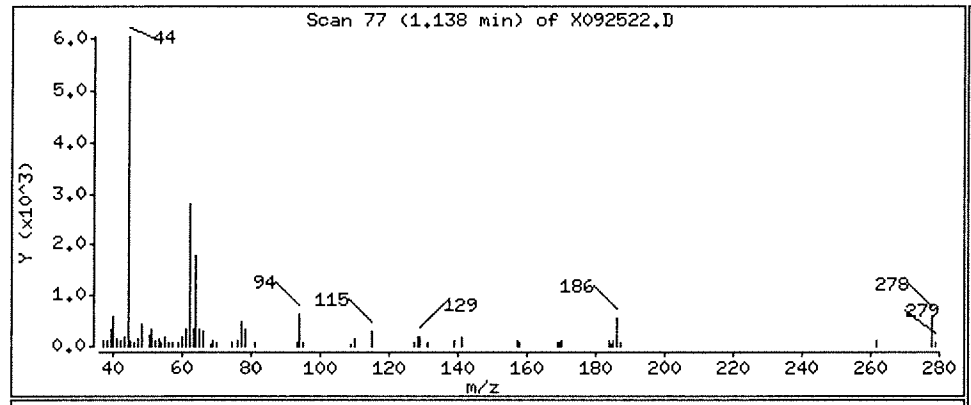
Operator: PC

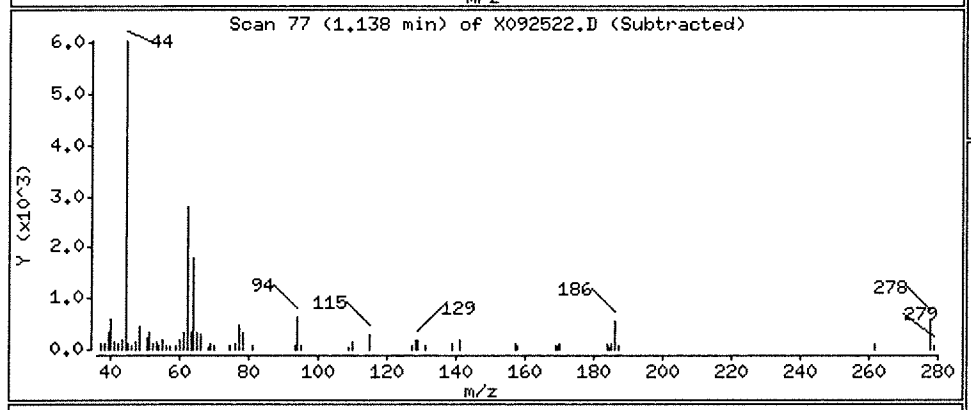
Column phase: DB624

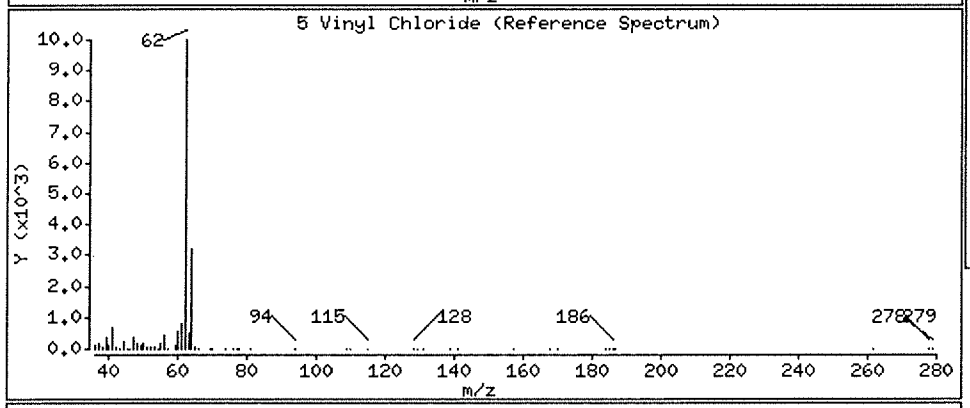
Column diameter: 0.18

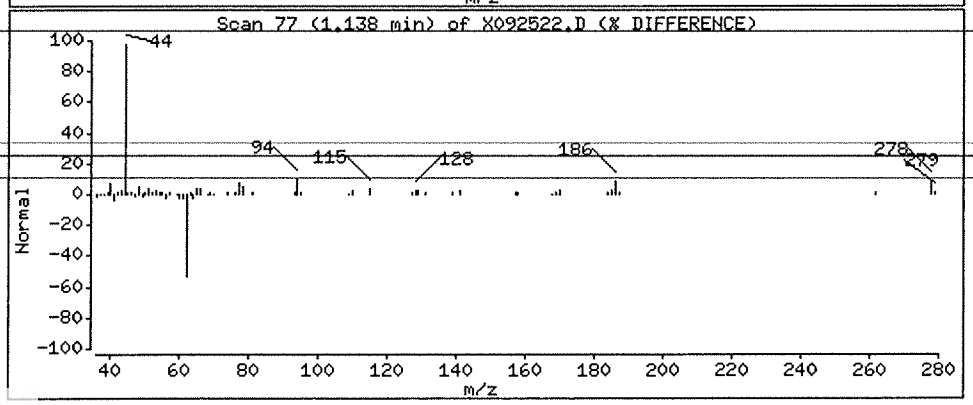
5 Vinyl Chloride

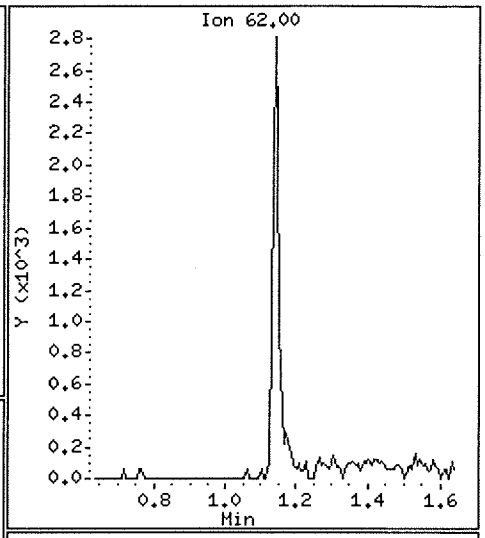
Concentration: 2.73 ug/l

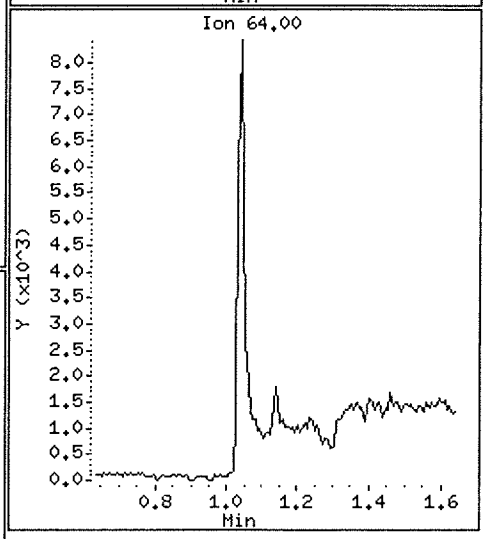












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092523.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092523.D
Lab Smp Id: HS19090860-09 Client Smp ID: HS19090860-09
Inj Date : 25-SEP-2019 19:02
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-09;HS19090860-09;;;
Misc Info : HS18090001;WATER;0;25;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 22
Dil Factor: 25.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

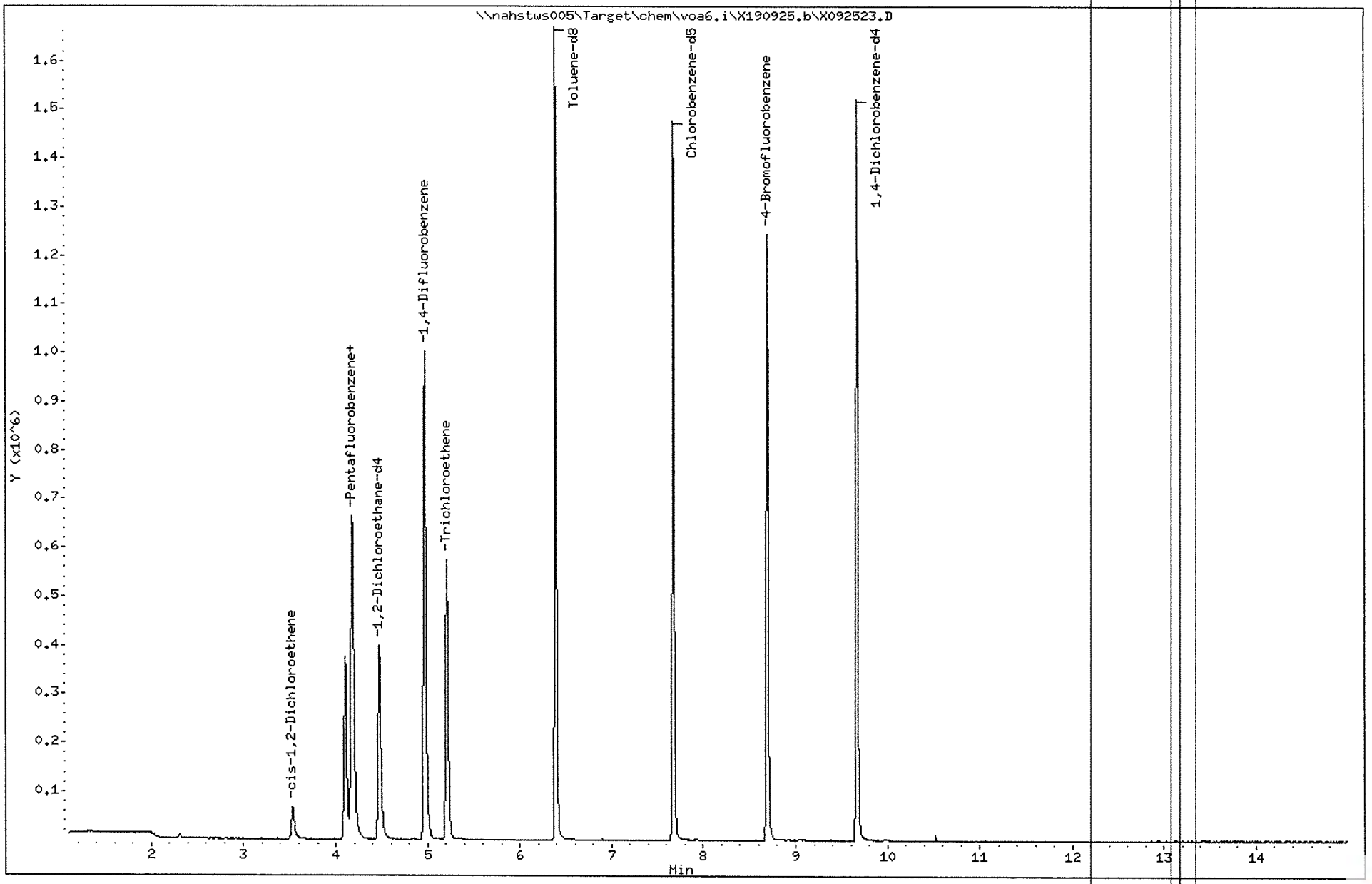
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	25.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	36487	5.10153	127.53
38 Trichloroethene	130	5.214	5.214	(1.049)	205249	31.7466	793.66
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	294768	44.6319	44.63
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	358133	52.0790	52.07
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	263470	46.5226	46.52
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	996508	49.1671	49.16
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	579346	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	843447	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	721303	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	371703	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092523.D
Date : 25-SEP-2019 19:02
Client ID: HS19090860-09
Sample Info: HS19090860-09;HS19090860-09;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092523.D

Date : 25-SEP-2019 19:02

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

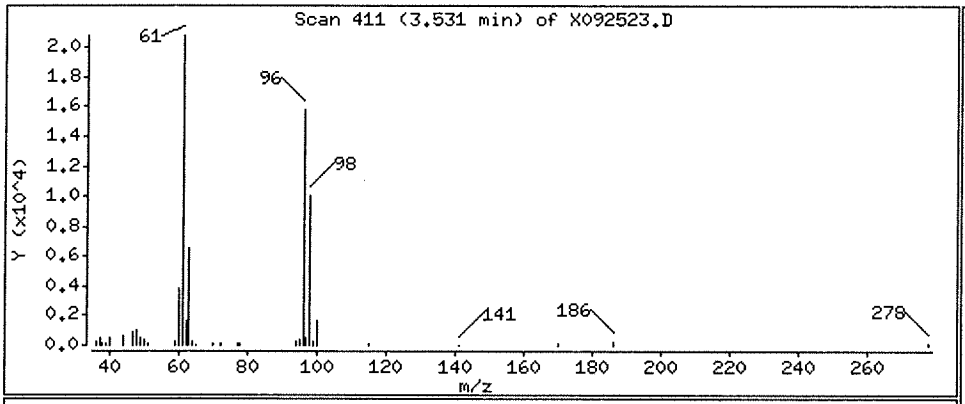
Operator: PC

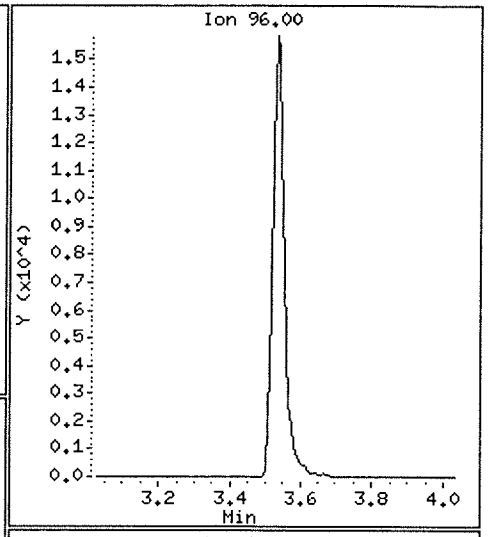
Column phase: DB624

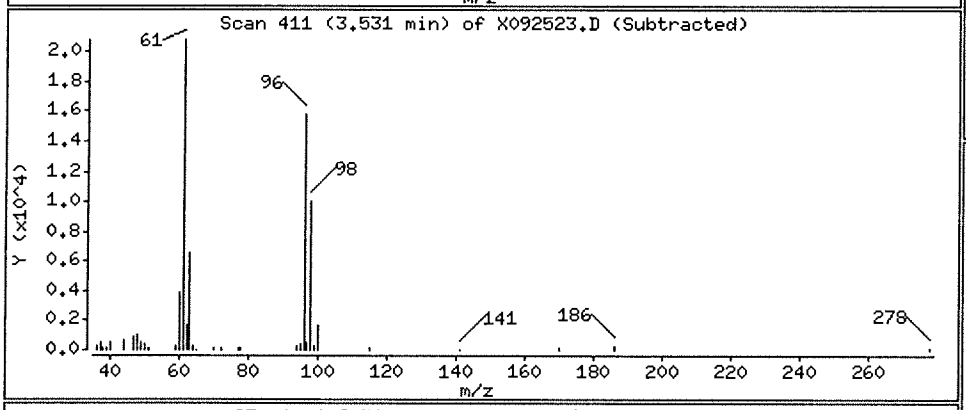
Column diameter: 0.18

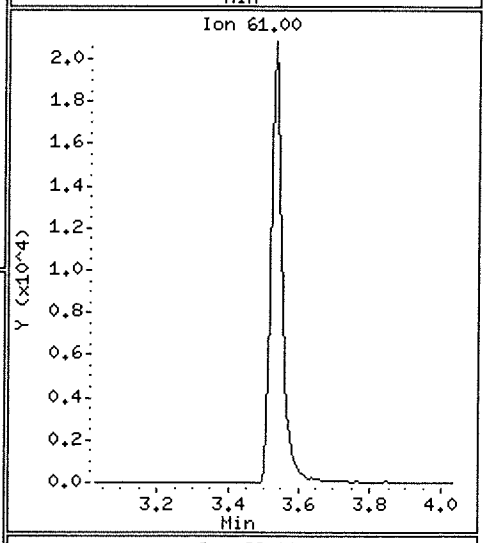
27 cis-1,2-Dichloroethene

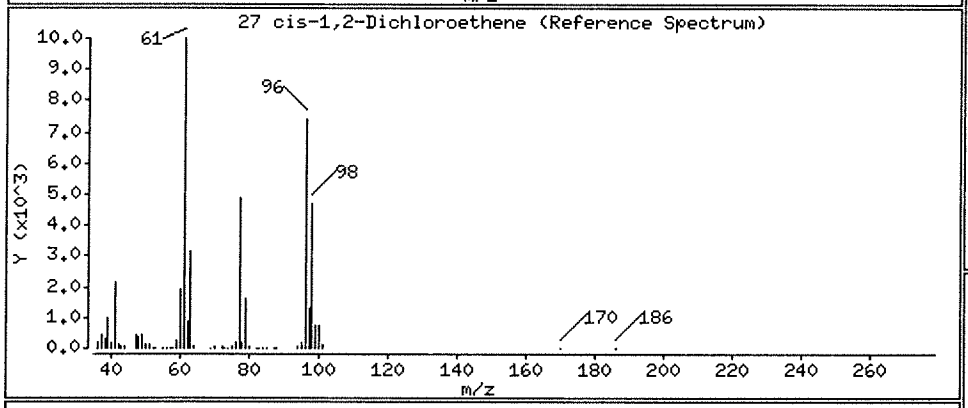
Concentration: 127.53 ug/l

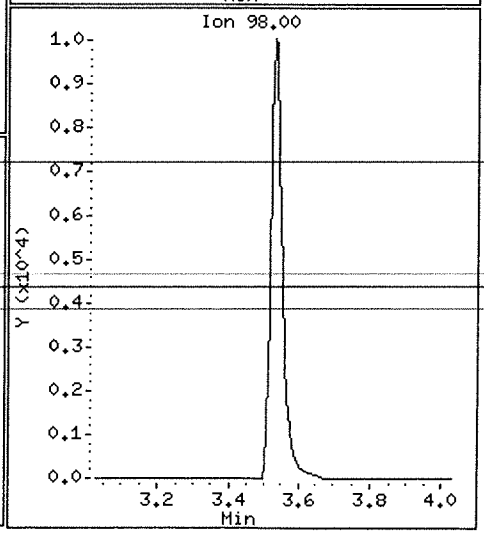


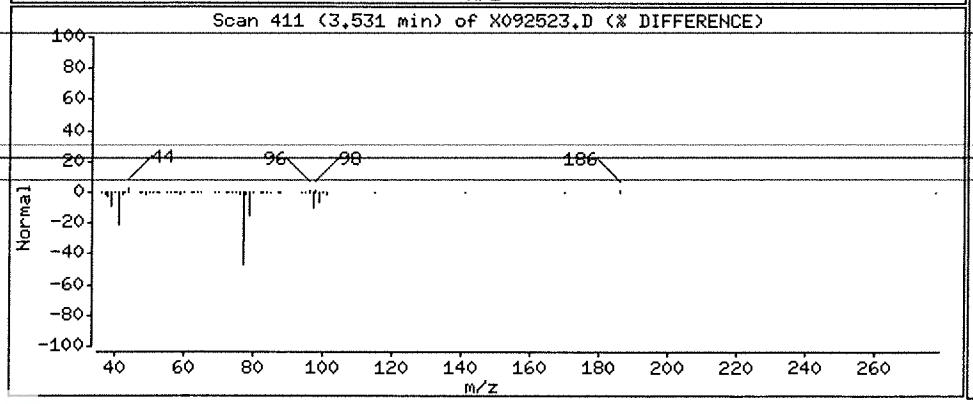












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092523.D

Date : 25-SEP-2019 19:02

Client ID: HS19090860-09

Instrument: voa6.i

Sample Info: HS19090860-09;HS19090860-09;;;

Purge Volume: 5.0

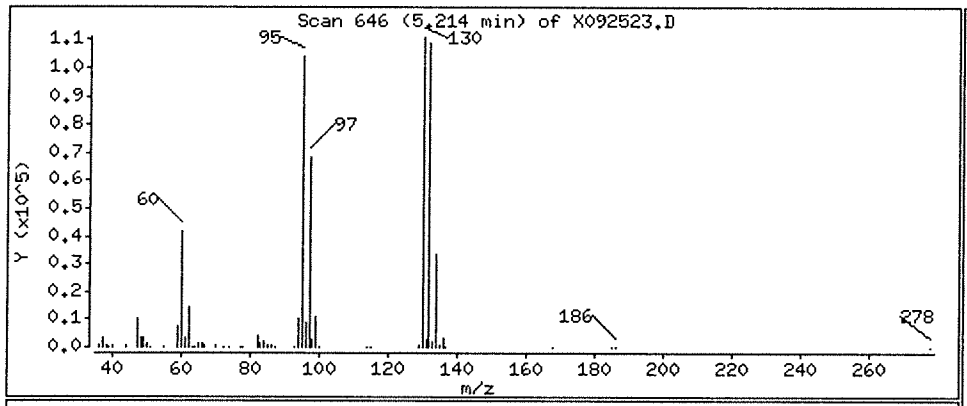
Operator: PC

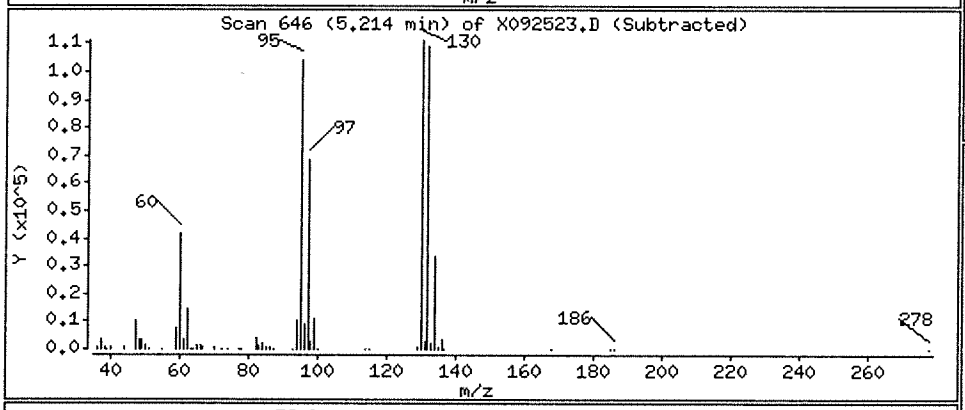
Column phase: DB624

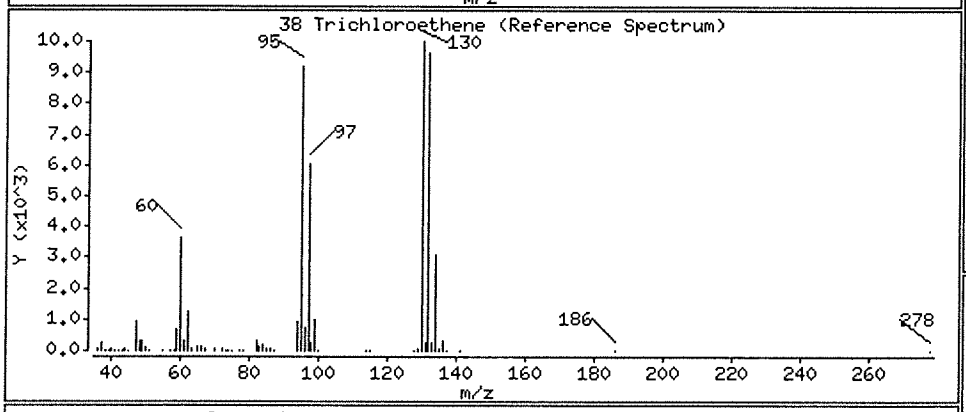
Column diameter: 0.18

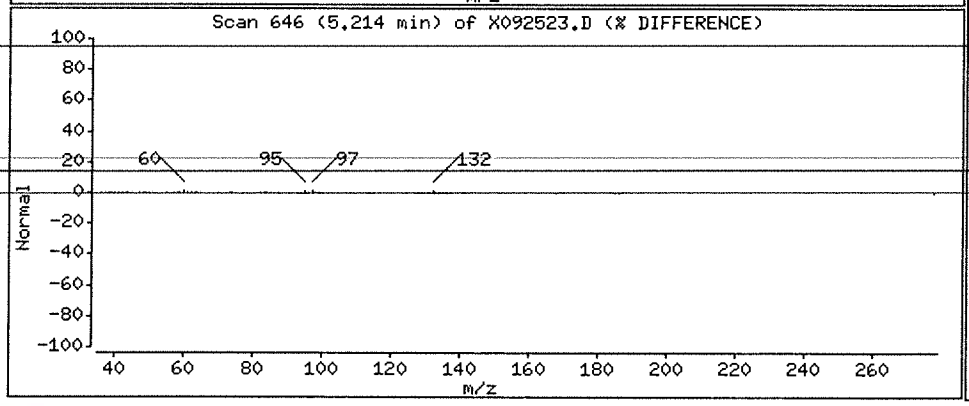
38 Trichloroethene

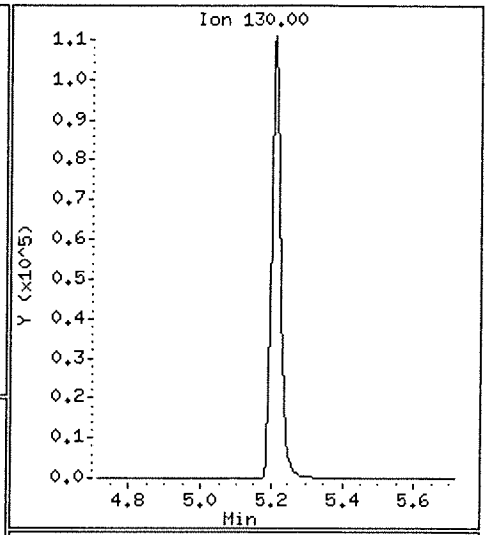
Concentration: 793.66 ug/l

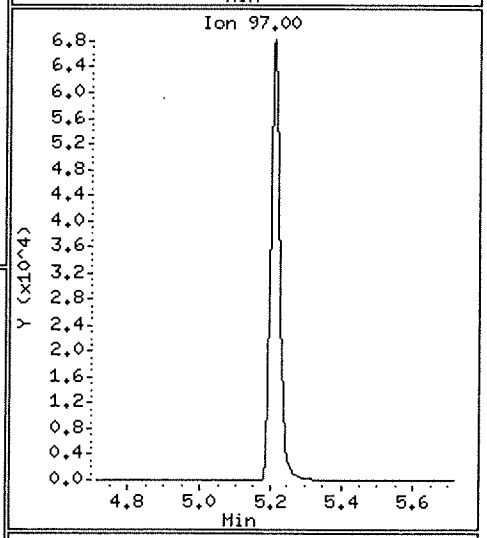


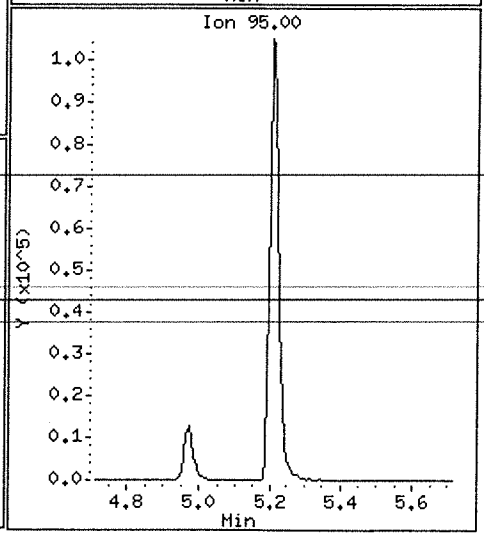












ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D
Lab Smp Id: HS19090860-06 Client Smp ID: HS19090860-06
Inj Date : 25-SEP-2019 19:26
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-06;HS19090860-06;;;
Misc Info : HS18090001;WATER;0;10;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 23
Dil Factor: 10.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	10.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

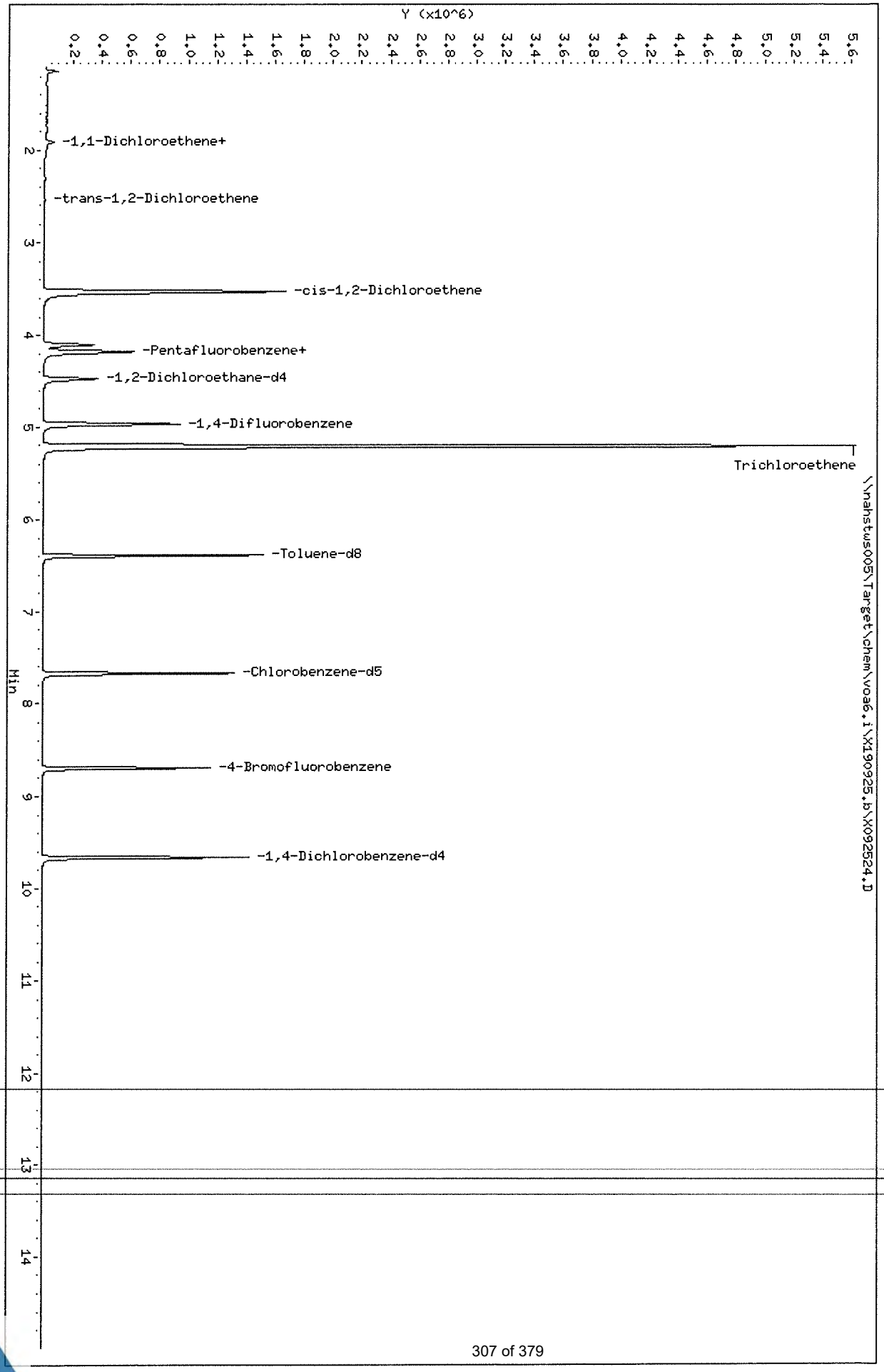
Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.919	1.912	(0.459)	5125	1.09729	10.97(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	867433	130.268	1302.68
38 Trichloroethene	130	5.214	5.214	(1.049)	2021602	332.085	3320.85(A)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	54914	8.04276	80.42
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	275354	44.7845	44.78
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	330789	52.5397	52.53
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	245999	46.6583	46.65
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	915696	49.3376	49.33
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	539384	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	794182	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	660519	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	351326	50.0000	

QC Flag Legend

~~a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).~~
A - Target compound detected but, quantitated amount exceeded maximum amount.

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D
Date : 25-SEP-2019 19:26
Client ID: HS19090860-06
Sample Info: HS19090860-06;HS19090860-06;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D

Date : 25-SEP-2019 19:26

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

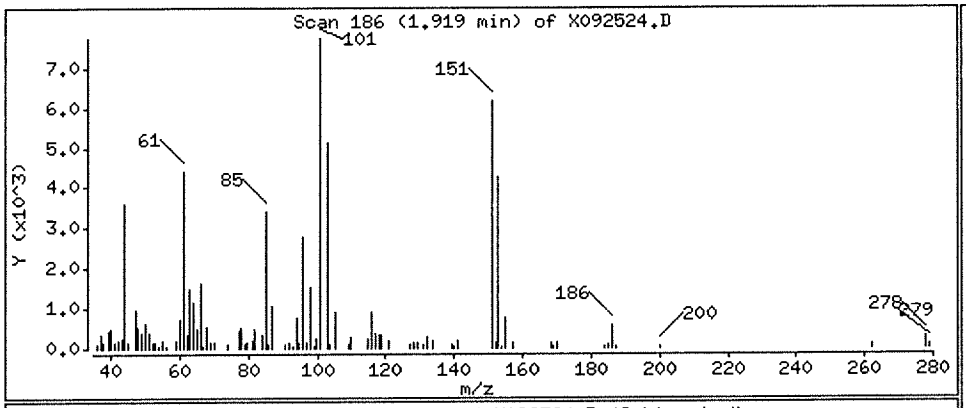
Operator: PC

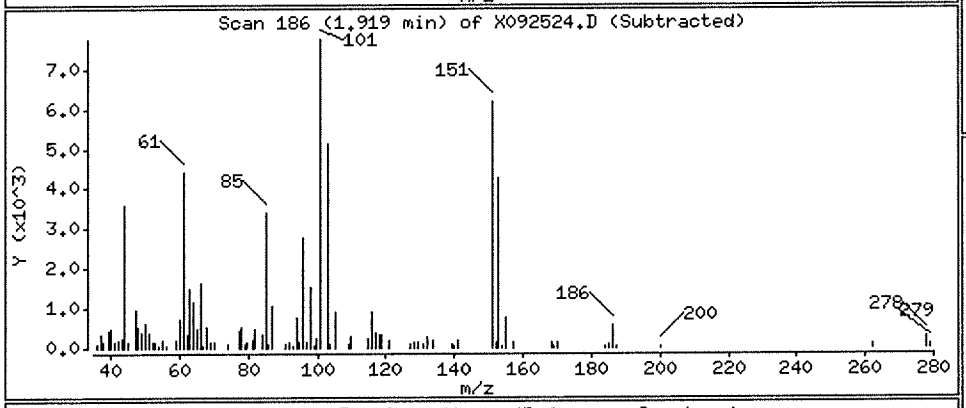
Column phase: DB624

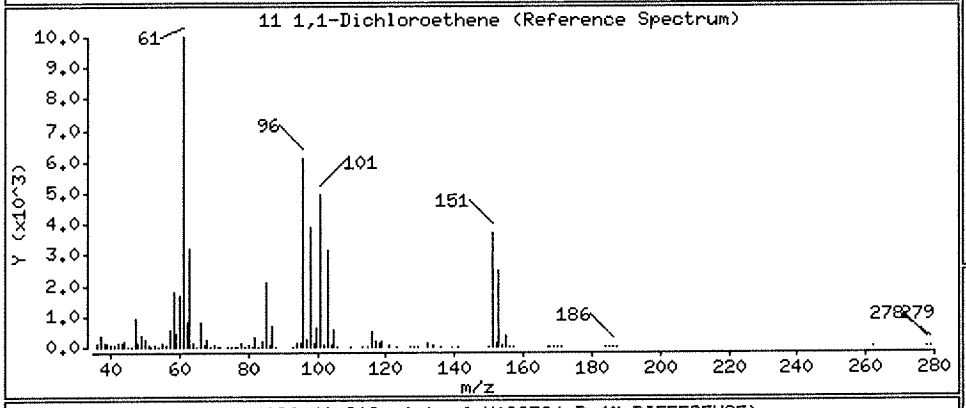
Column diameter: 0.18

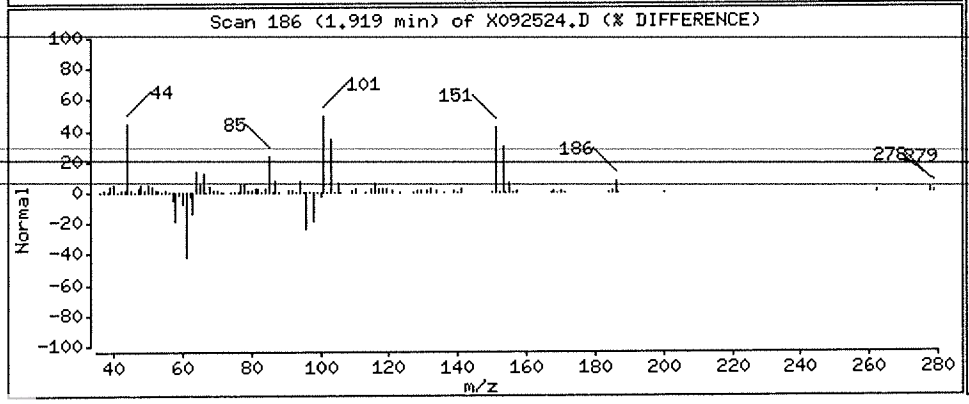
11 1,1-Dichloroethene

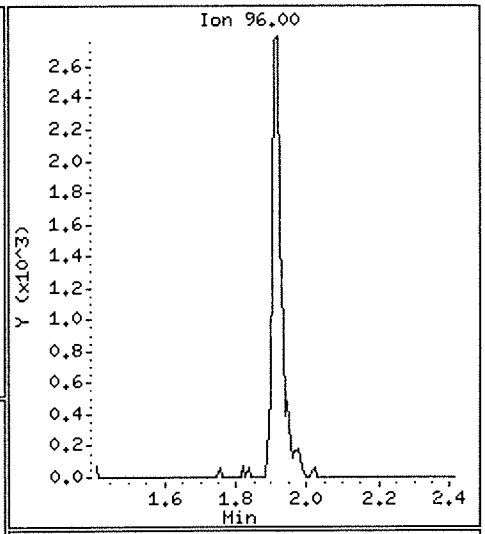
Concentration: 10.97 ug/l

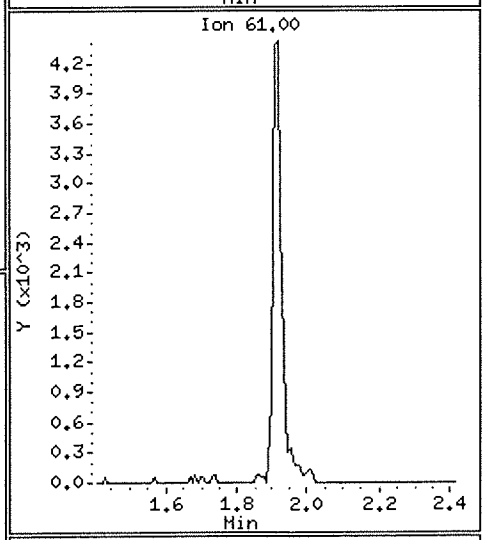


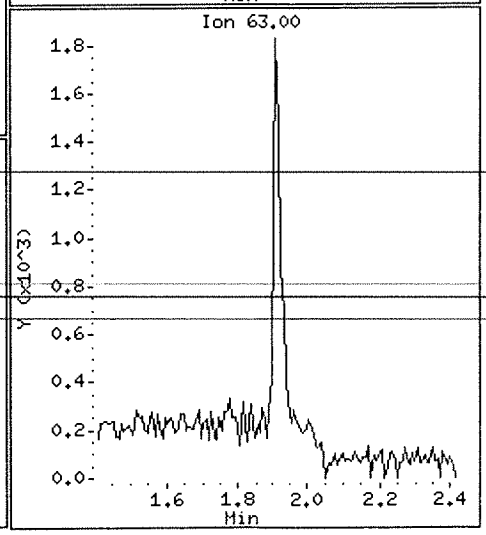












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D

Date : 25-SEP-2019 19:26

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

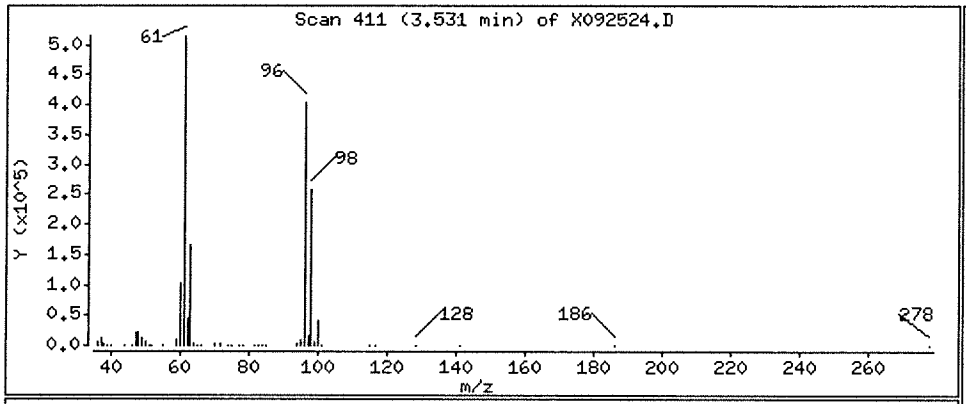
Operator: PC

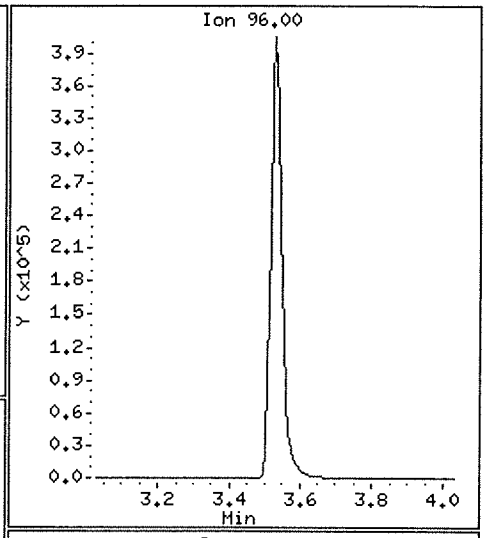
Column phase: DB624

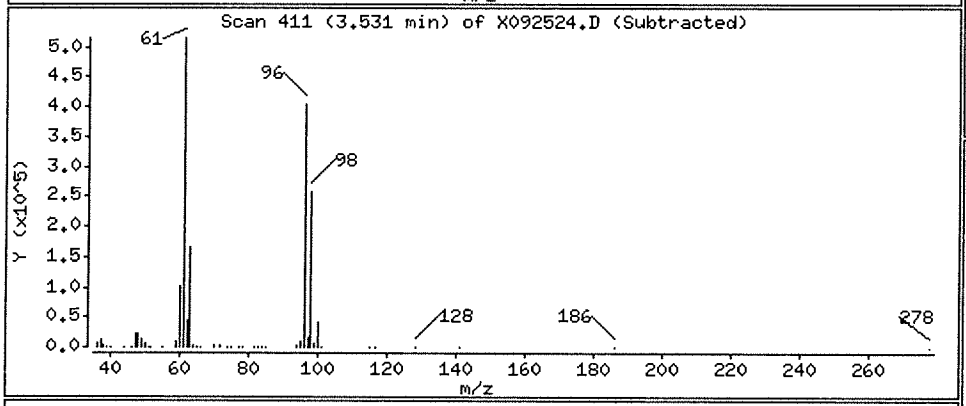
Column diameter: 0.18

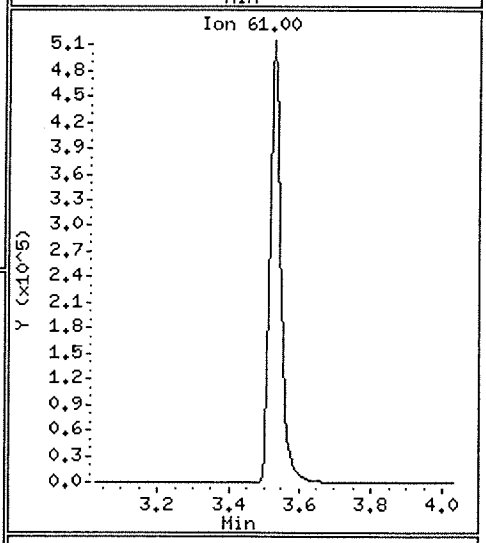
27 cis-1,2-Dichloroethene

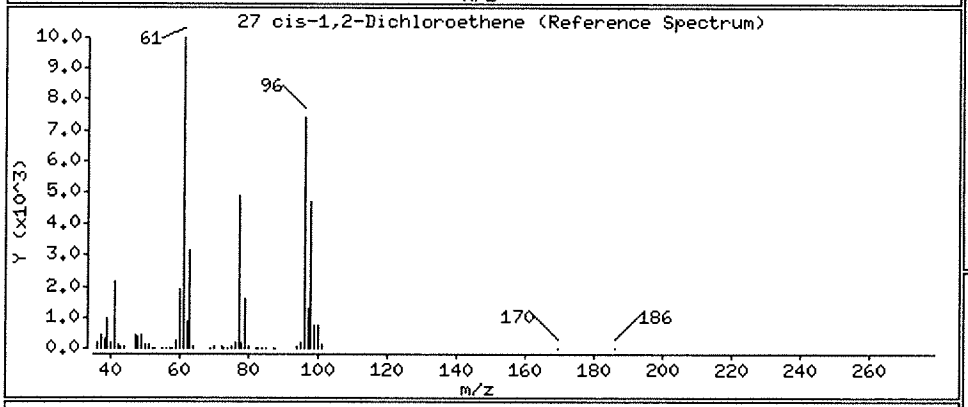
Concentration: 1302.68 ug/l

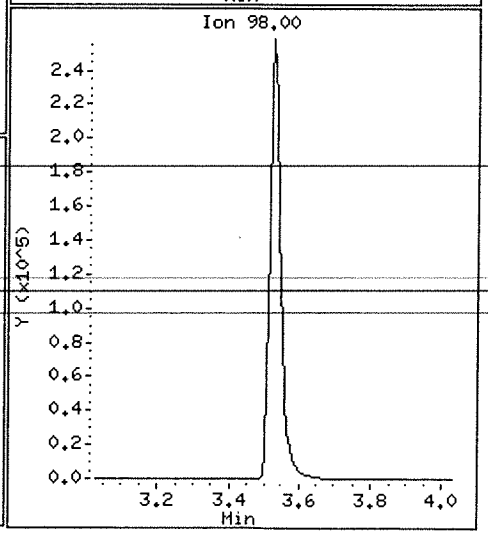


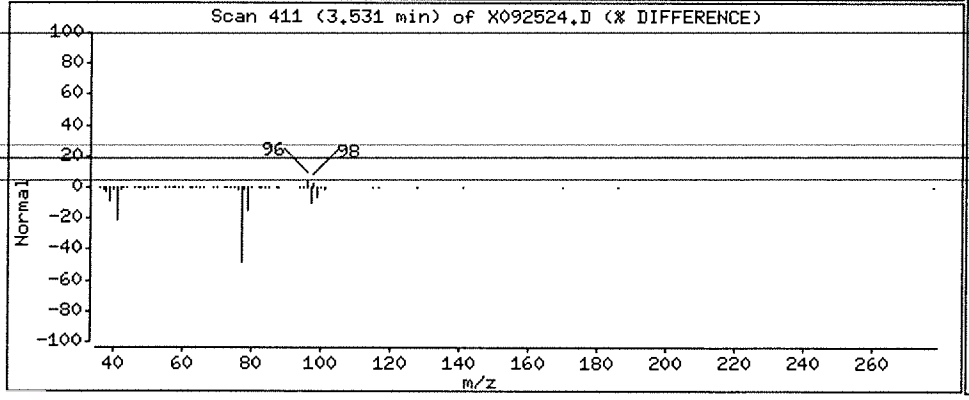












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D

Date : 25-SEP-2019 19:26

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

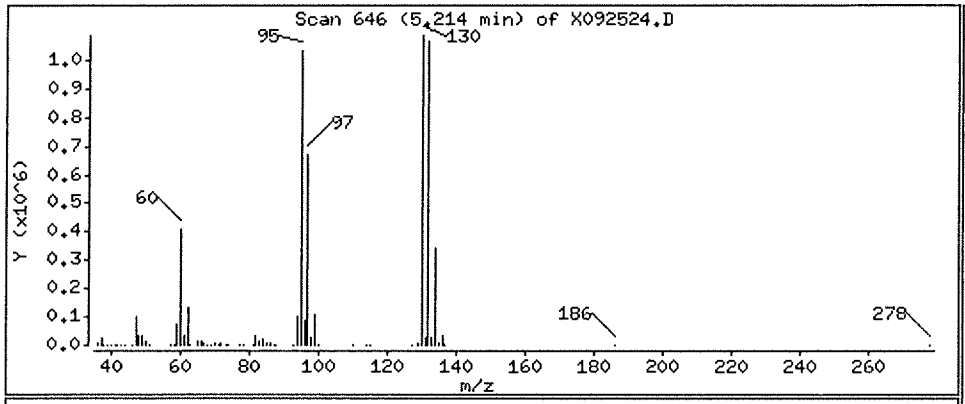
Operator: PC

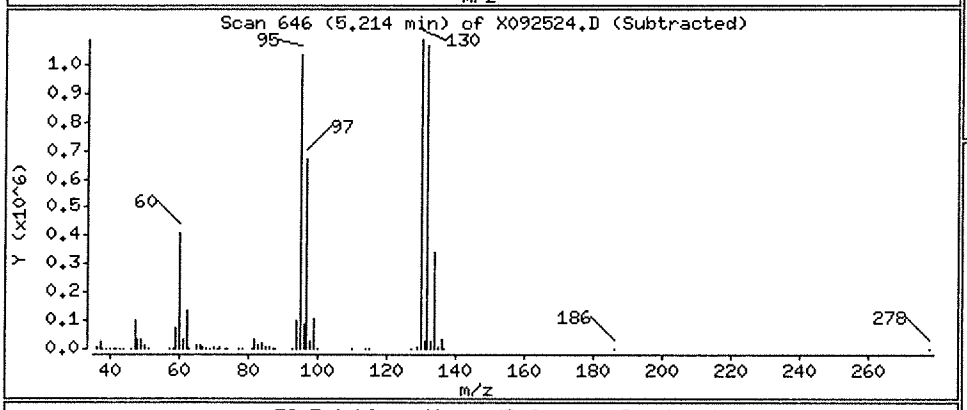
Column phase: DB624

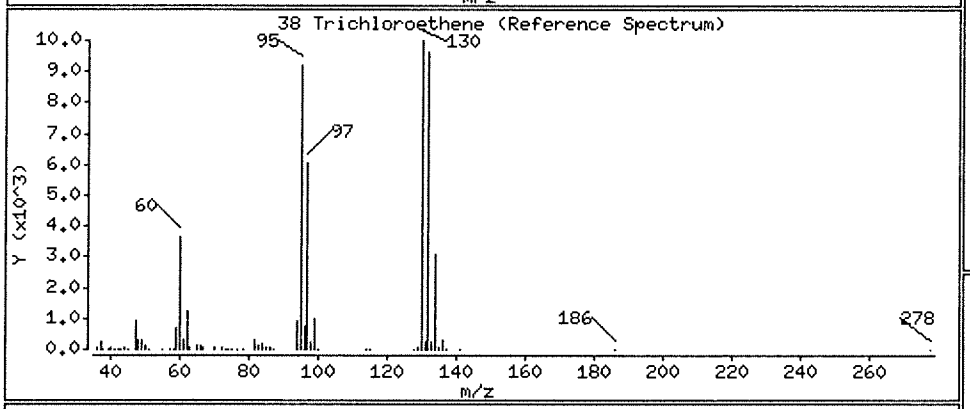
Column diameter: 0.18

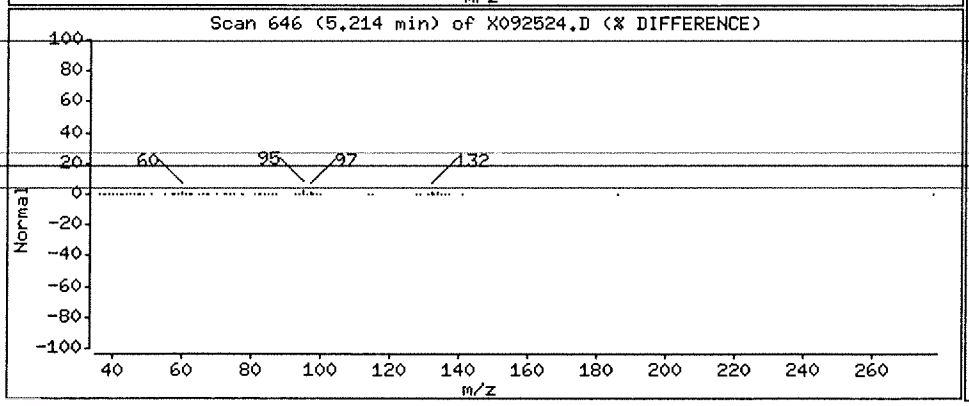
38 Trichloroethene

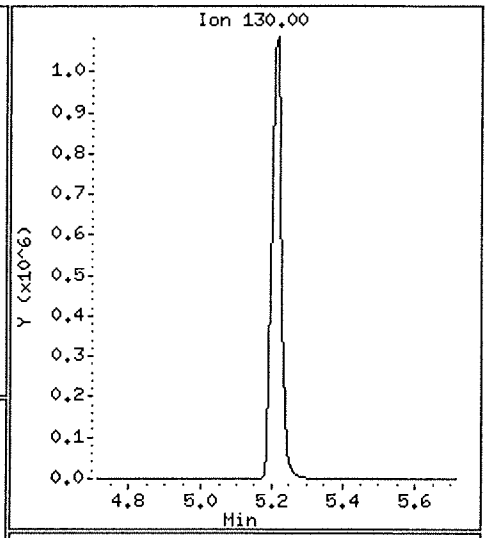
Concentration: 3320.85 ug/l

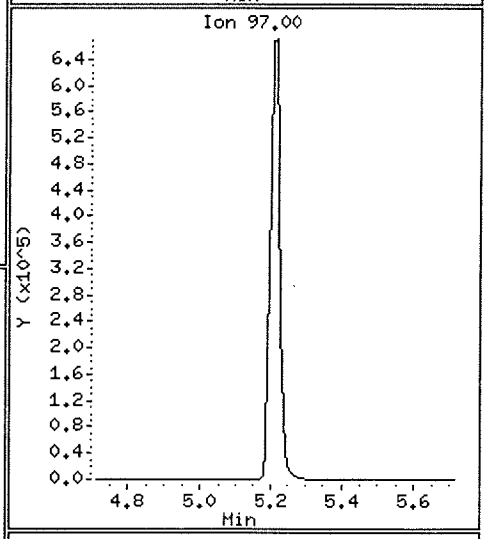


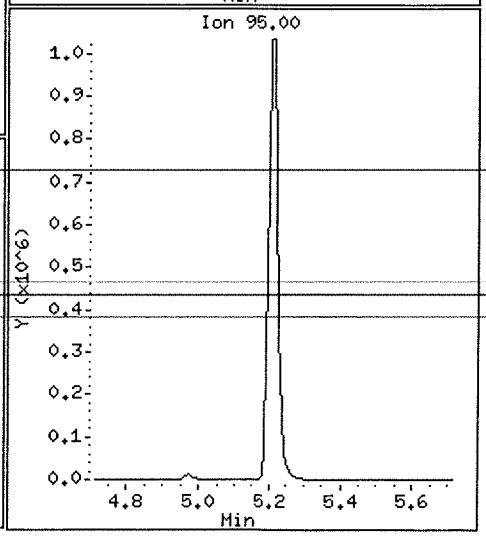












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092524.D

Date : 25-SEP-2019 19:26

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

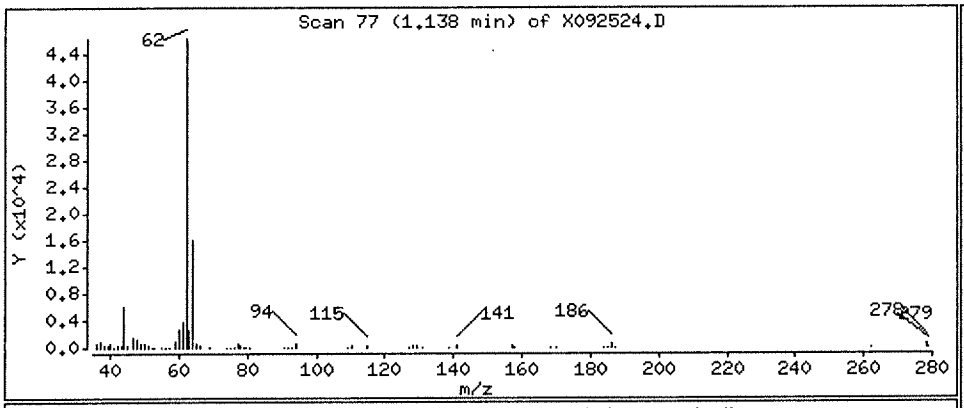
Operator: PC

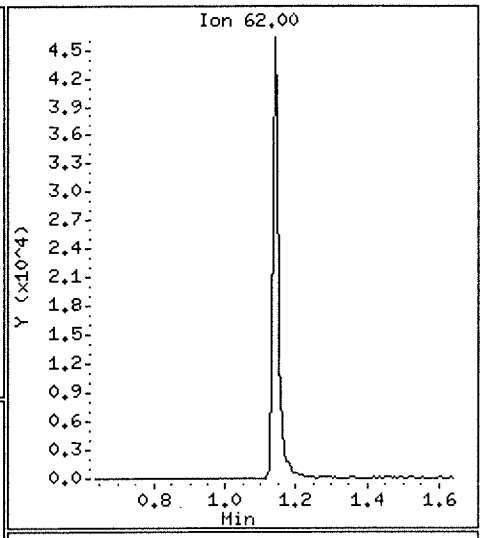
Column phase: DB624

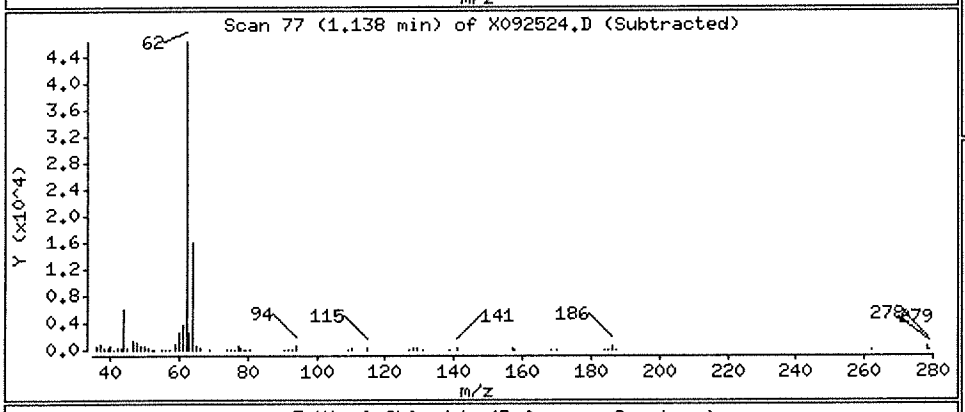
Column diameter: 0.18

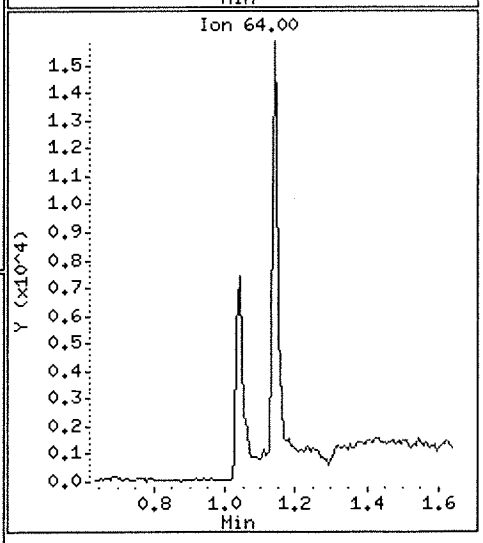
5 Vinyl Chloride

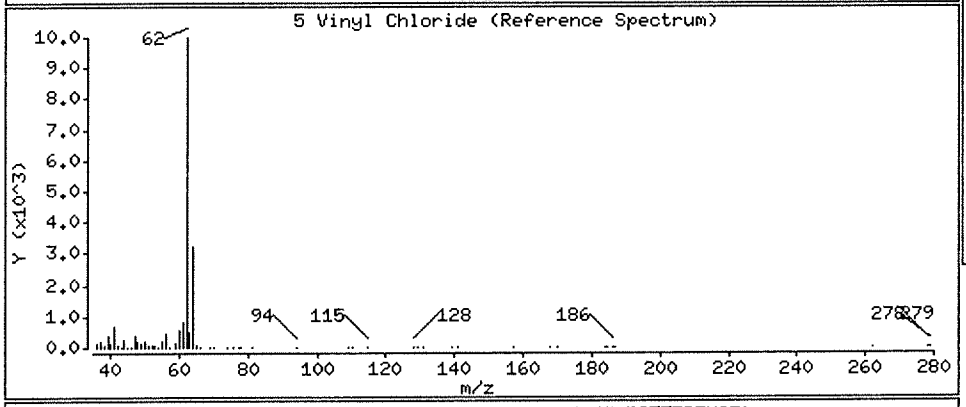
Concentration: 80.42 ug/l

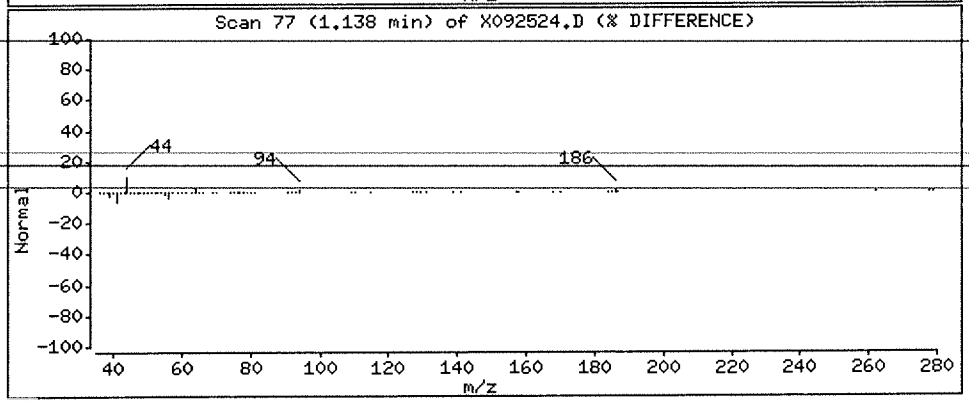












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D
Lab Smp Id: HS19090860-06 Client Smp ID: HS19090860-06
Inj Date : 25-SEP-2019 19:50
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-06;HS19090860-06;;;
Misc Info : HS18090001;WATER;0;100;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 24
Dil Factor: 100.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	100.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	95051	14.2207	1422.06
38 Trichloroethene	130	5.214	5.214	(1.049)	237243	38.8152	3881.52
5 Vinyl Chloride	62	1.138	1.138	(0.272)	6193	0.90362	90.36(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	278001	45.0504	45.05
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	342115	52.4933	52.49
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	248797	47.0178	47.01
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	943141	49.0916	49.09
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	541423	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	797379	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	683725	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	349817	50.0000	

QC Flag Legend

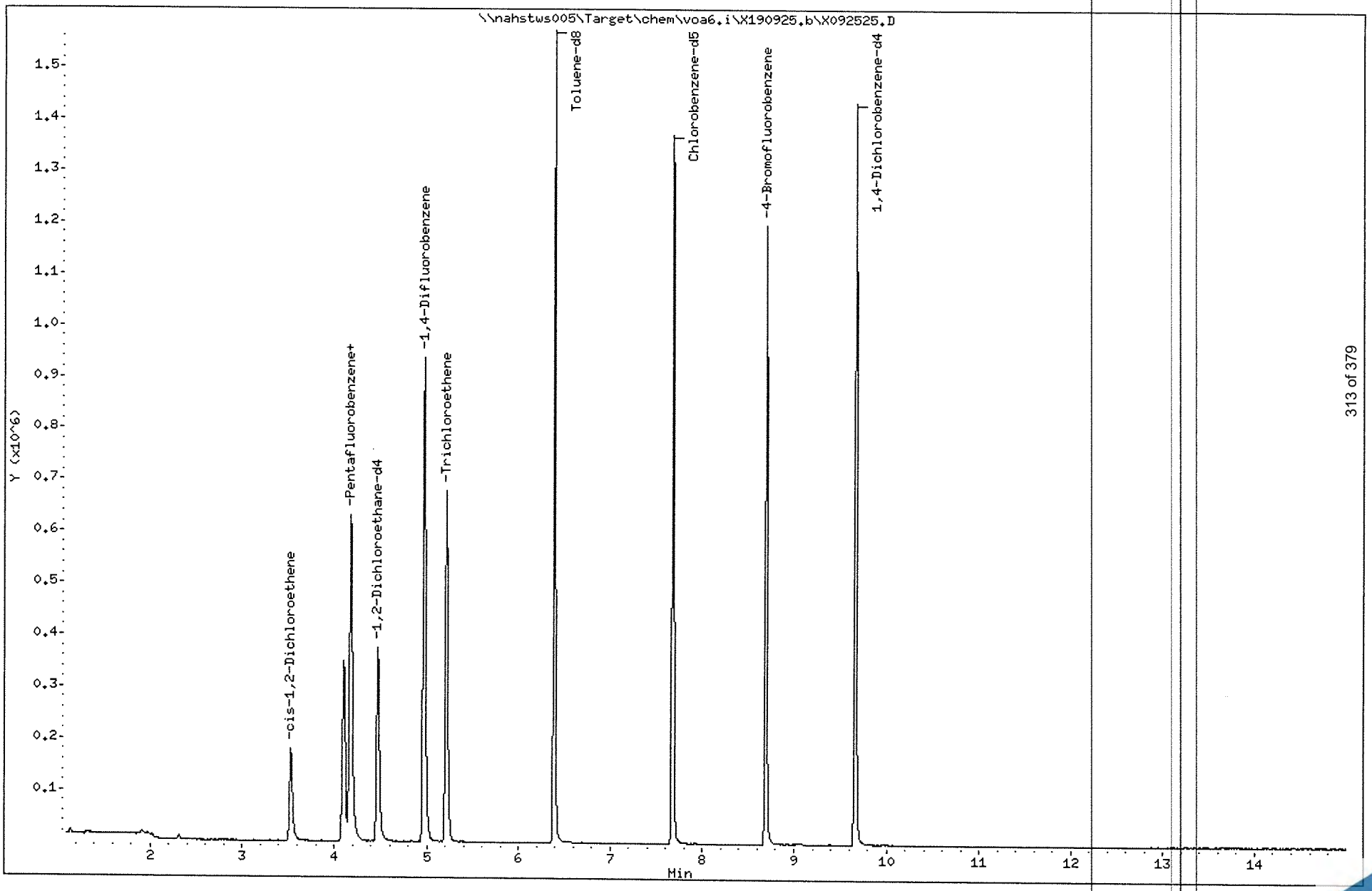
a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

01030072

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D
Date : 25-SEP-2019 19:50
Client ID: HS19090860-06
Sample Info: HS19090860-06;HS19090860-06;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D

Date : 25-SEP-2019 19:50

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

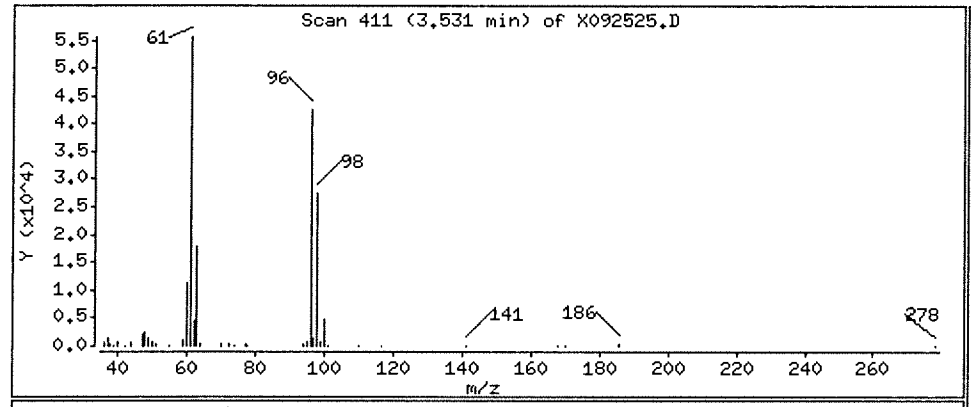
Operator: PC

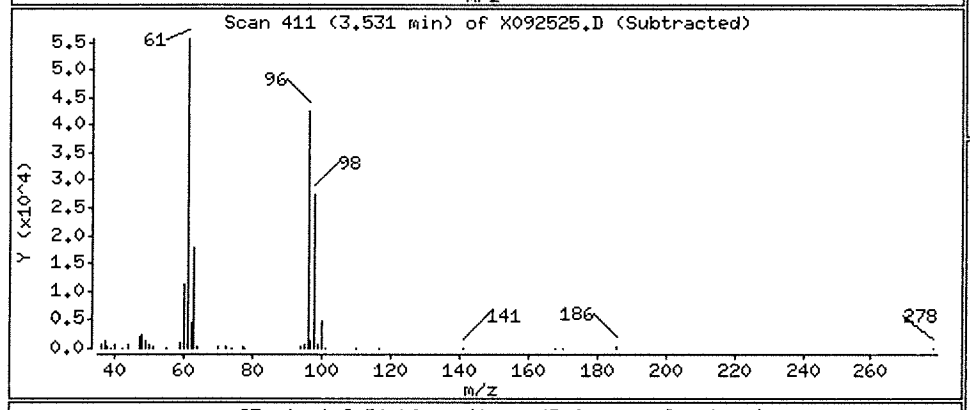
Column phase: DB624

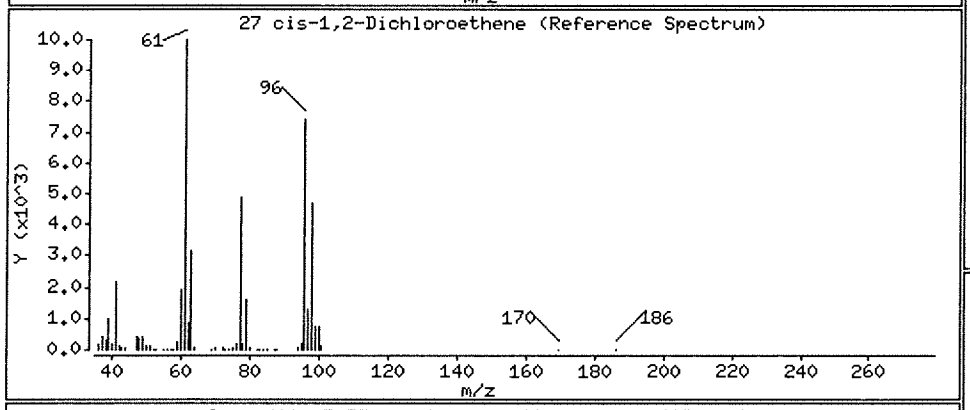
Column diameter: 0.18

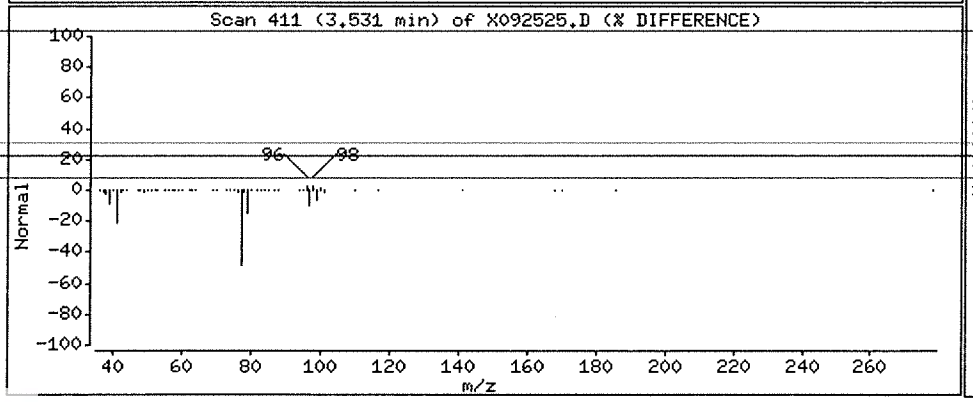
27 cis-1,2-Dichloroethene

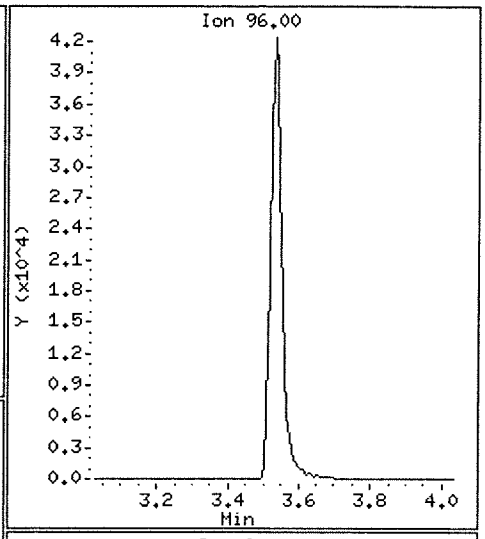
Concentration: 1422.06 ug/l

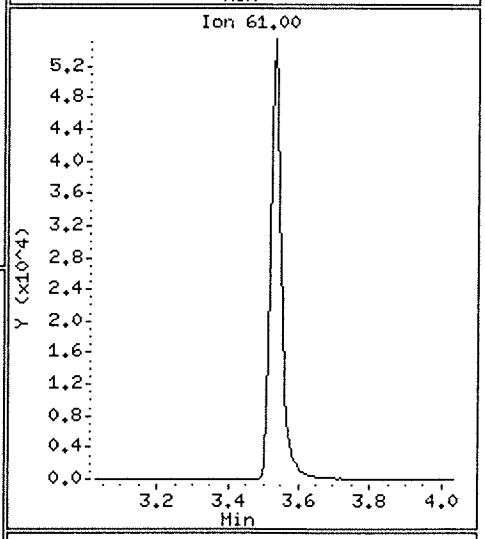


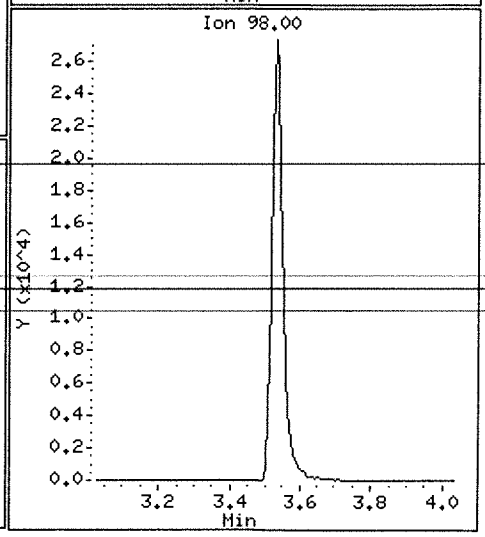












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D

Date : 25-SEP-2019 19:50

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

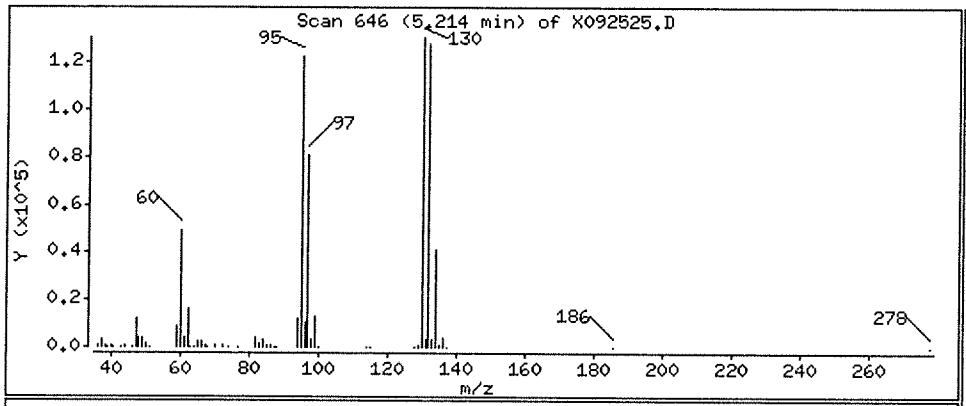
Operator: PC

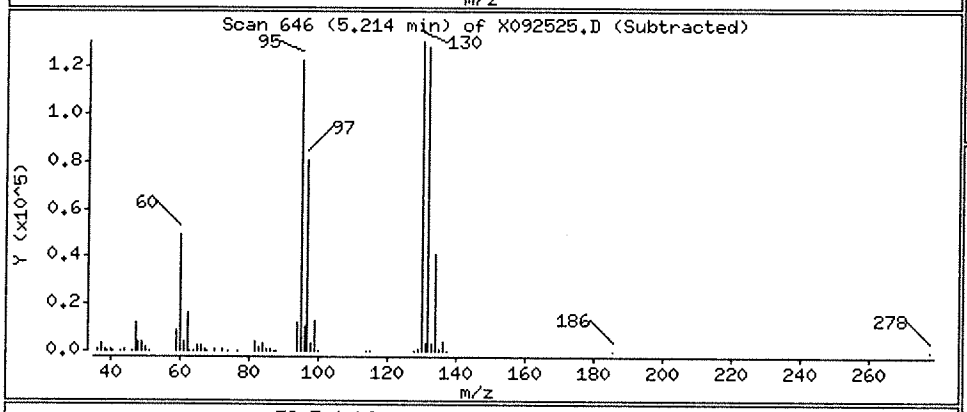
Column phase: DB624

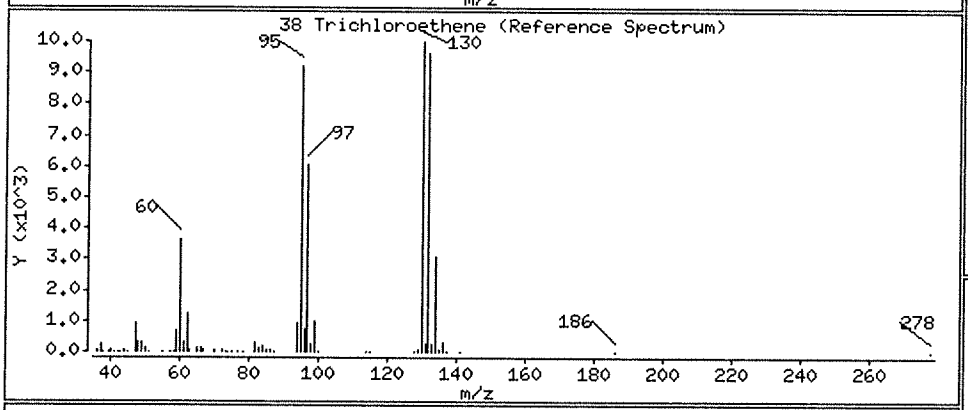
Column diameter: 0.18

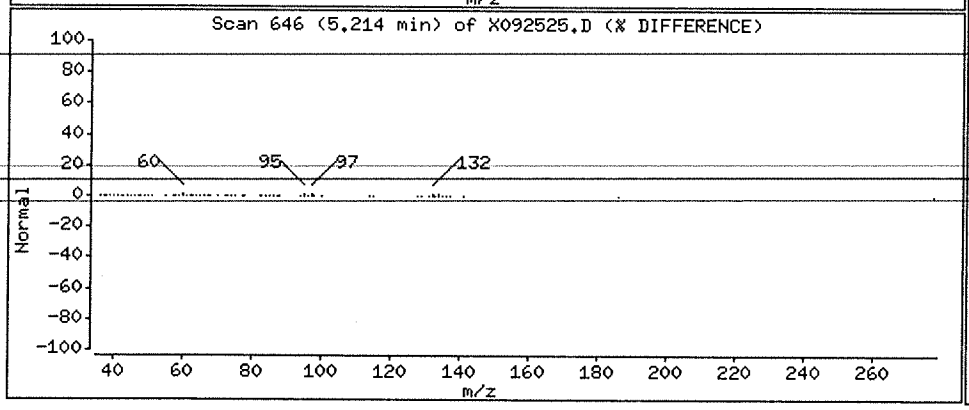
38 Trichloroethene

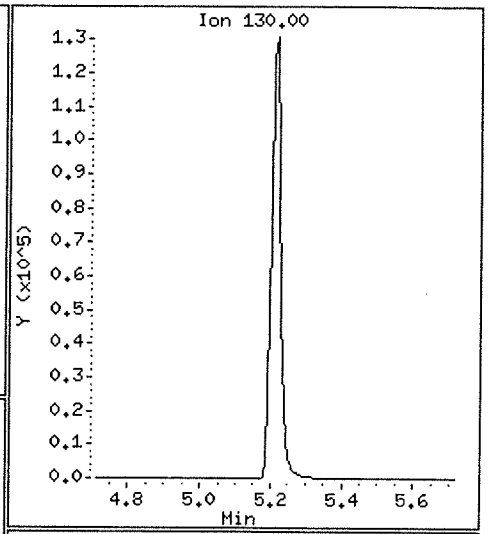
Concentration: 3881.52 ug/l

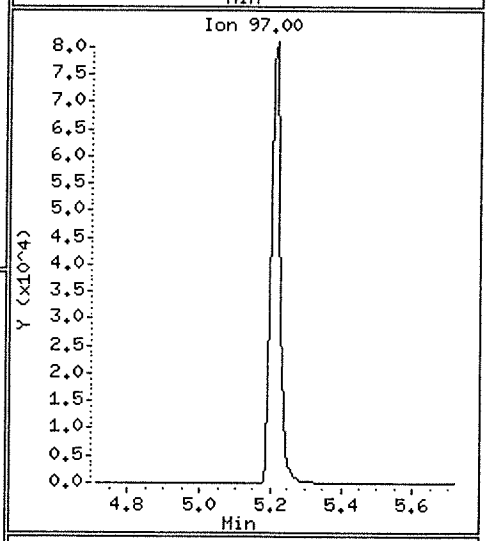


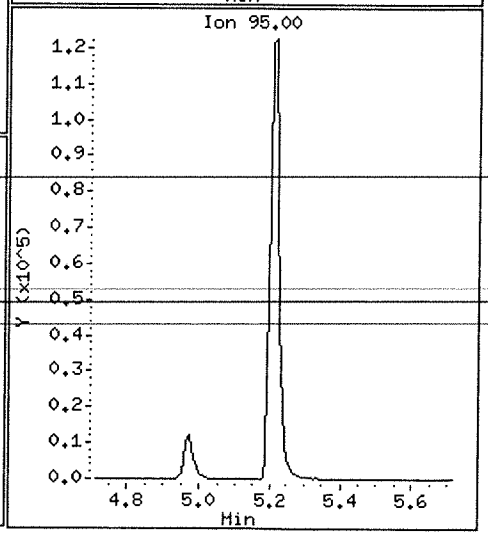












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092525.D

Date : 25-SEP-2019 19:50

Client ID: HS19090860-06

Instrument: voa6.i

Sample Info: HS19090860-06;HS19090860-06;;;

Purge Volume: 5.0

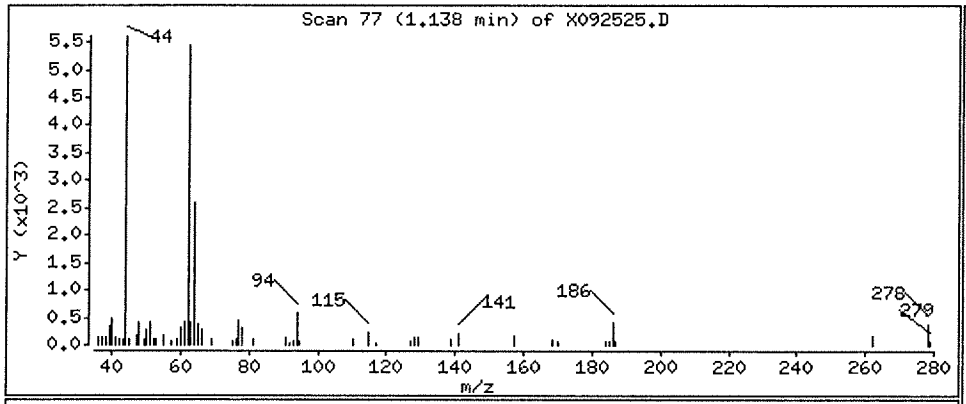
Operator: PC

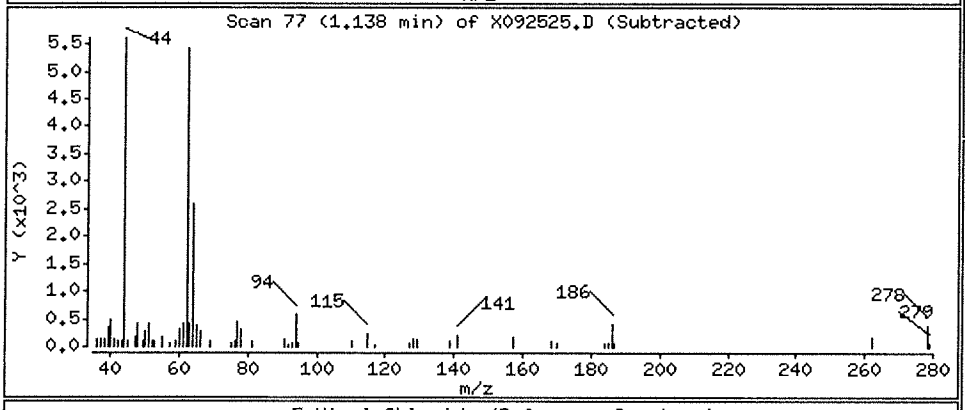
Column phase: DB624

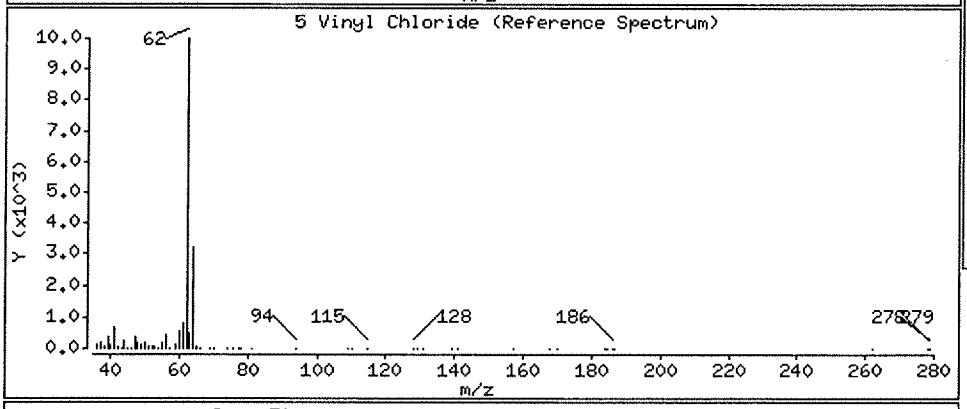
Column diameter: 0.18

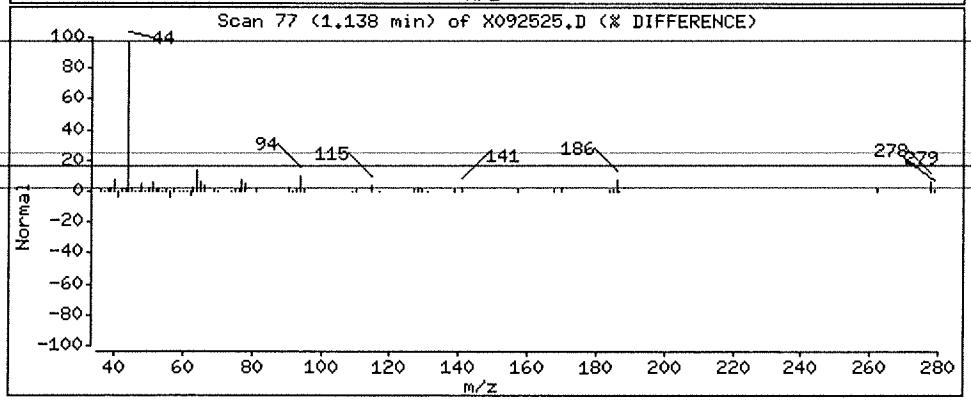
5 Vinyl Chloride

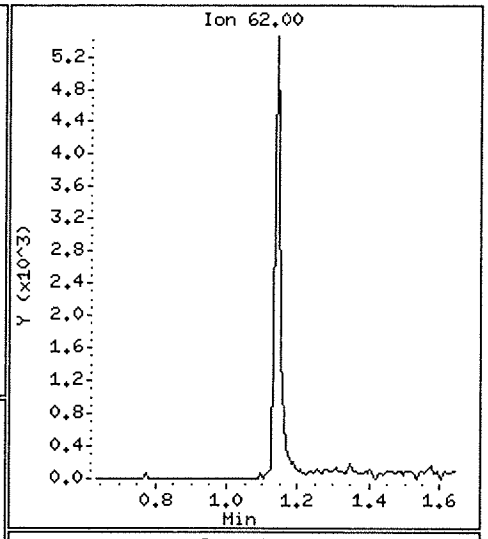
Concentration: 90.36 ug/l

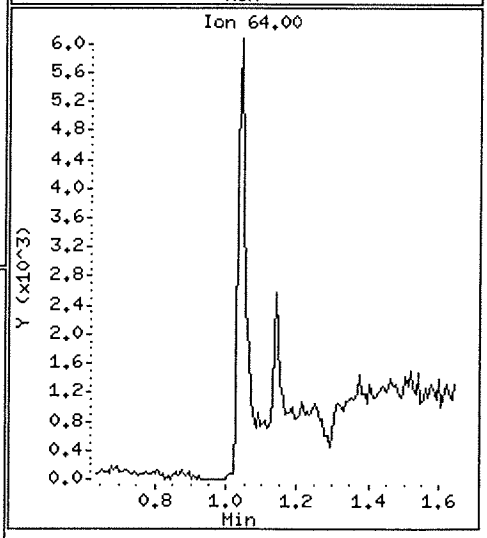












ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092526.D
Lab Smp Id: HS19090860-07 Client Smp ID: HS19090860-07
Inj Date : 25-SEP-2019 20:14
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-07;HS19090860-07;;;
Misc Info : HS18090001;WATER;0;10;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 25
Dil Factor: 10.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	10.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	69549	10.4328	104.32
38 Trichloroethene	130	5.207	5.214	(1.048)	757159	124.832	1248.32
5 Vinyl Chloride	62	1.138	1.138	(0.272)	4254	0.62234	6.22(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	275167	44.7017	44.70
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	318895	51.1330	51.13
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	242101	45.8525	45.85
$ 48 Toluene-d8	98	6.389	6.388	(0.833)	914020	49.7468	49.74
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	539995	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	791287	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	653886	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	309548	50.0000	

QC Flag Legend

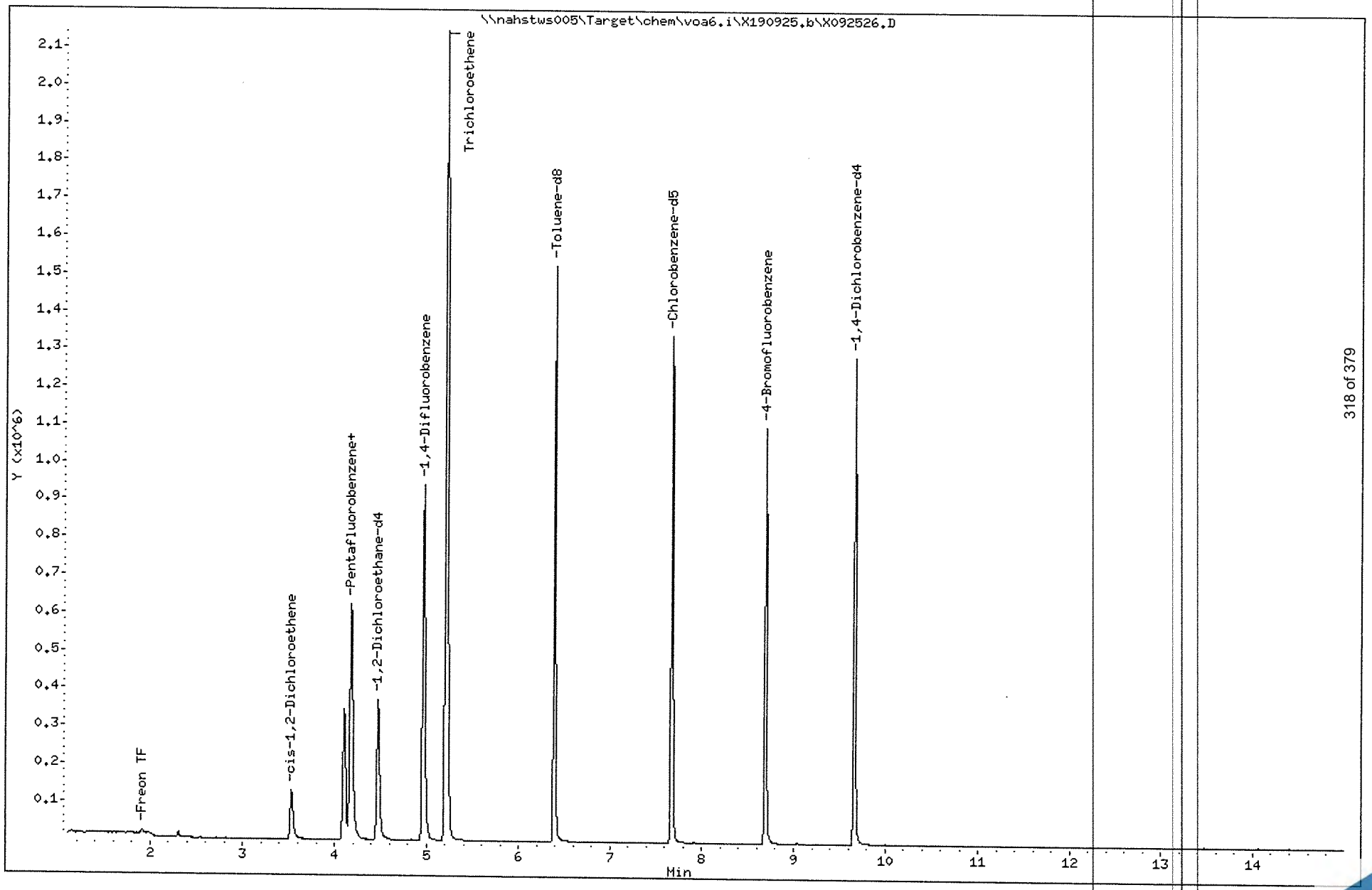
a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

01030077

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092526.D
Date : 25-SEP-2019 20:14
Client ID: HS19090860-07
Sample Info: HS19090860-07;HS19090860-07;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092526.D

Date : 25-SEP-2019 20:14

Client ID: HS19090860-07

Instrument: voa6.i

Sample Info: HS19090860-07;HS19090860-07;;;

Purge Volume: 5.0

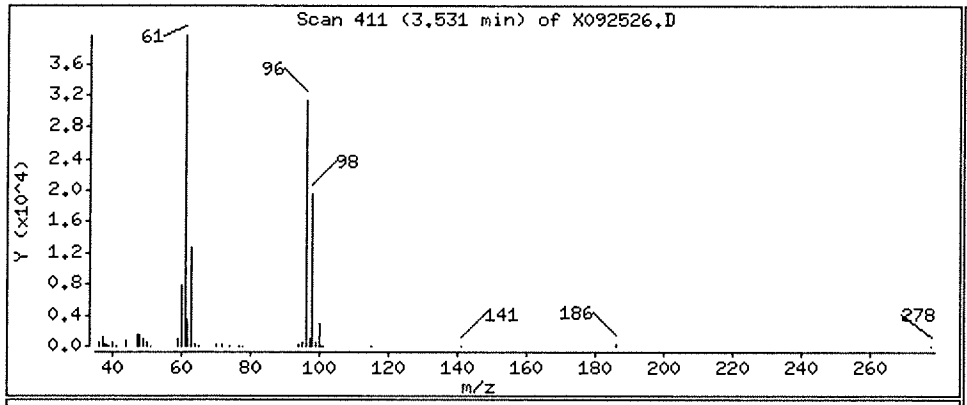
Operator: PC

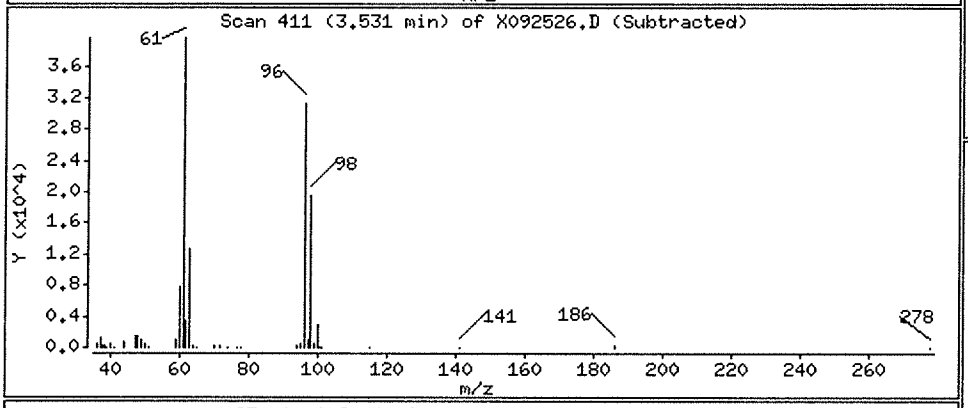
Column phase: DB624

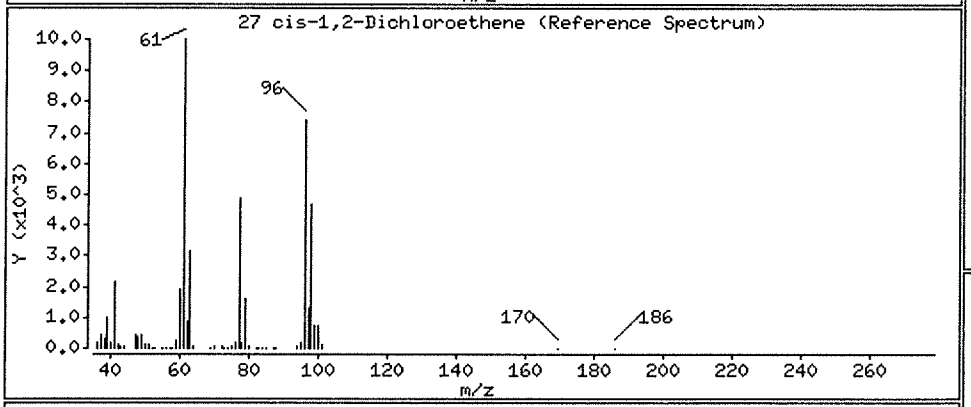
Column diameter: 0.18

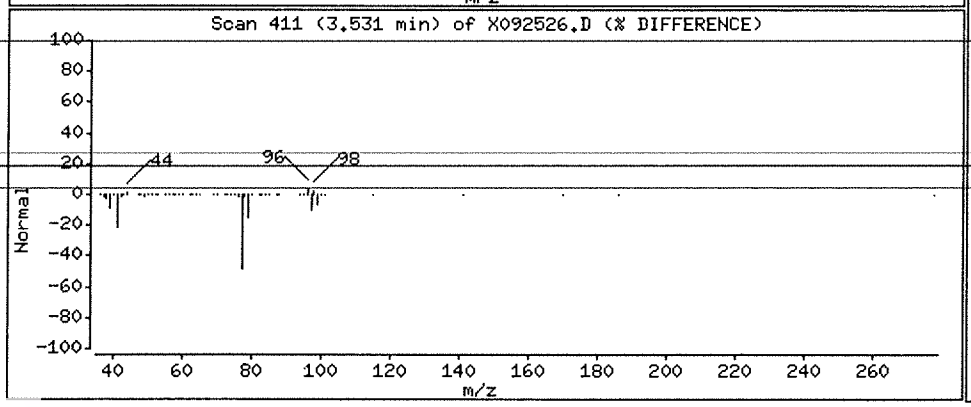
27 cis-1,2-Dichloroethene

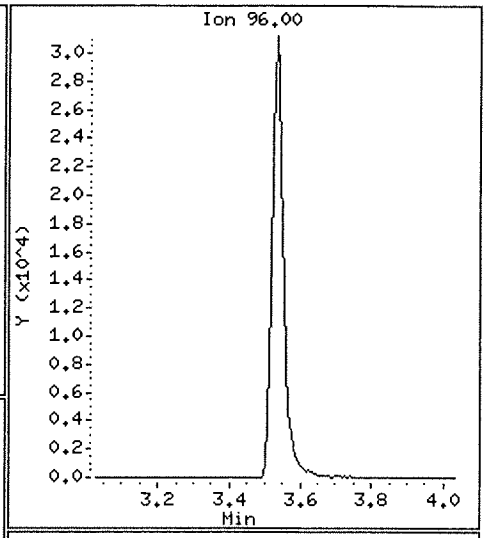
Concentration: 104.32 ug/l

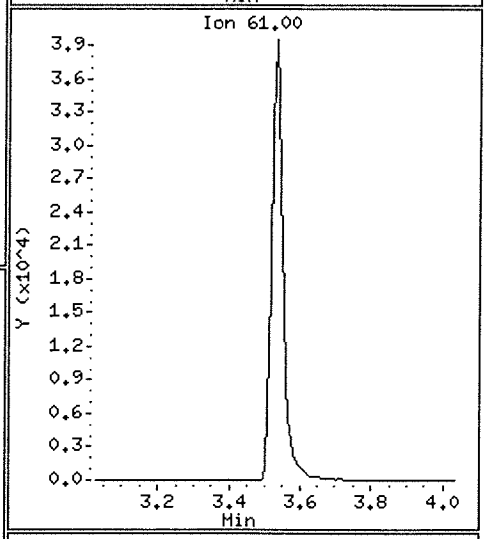


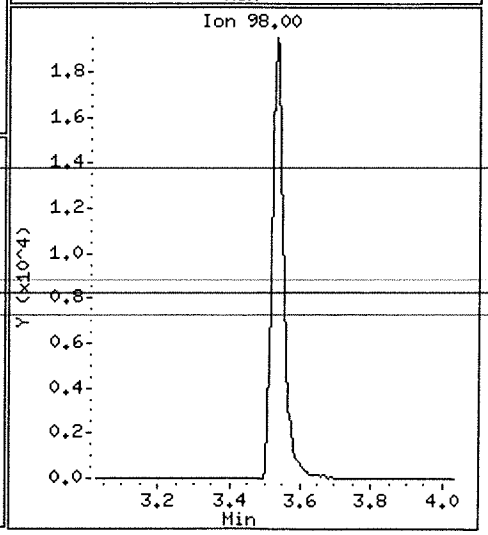












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092526.D

Date : 25-SEP-2019 20:14

Client ID: HS19090860-07

Instrument: voa6.i

Sample Info: HS19090860-07;HS19090860-07;;;

Purge Volume: 5.0

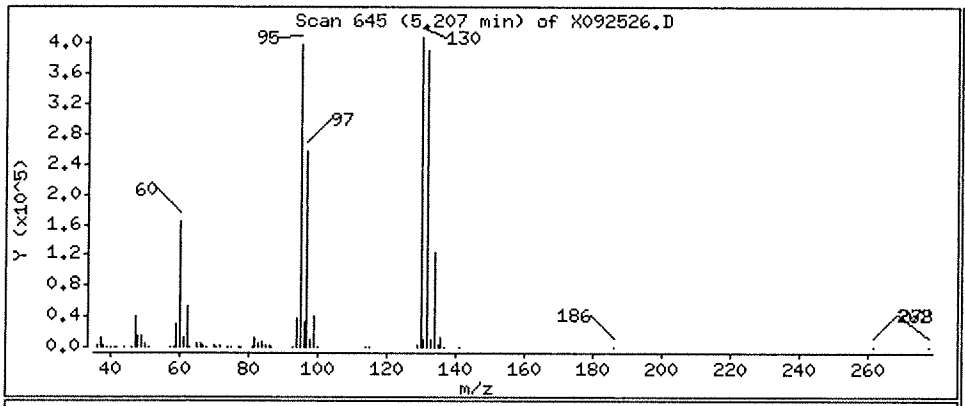
Operator: PC

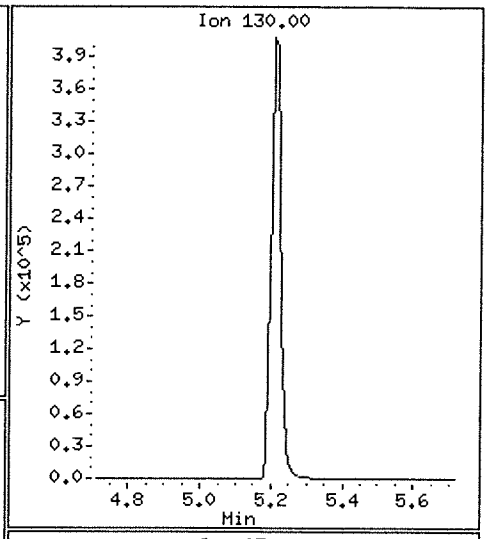
Column phase: DB624

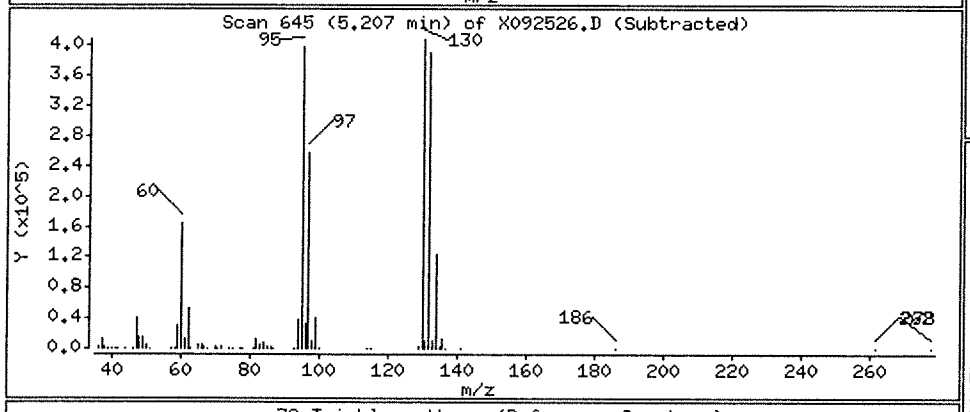
Column diameter: 0.18

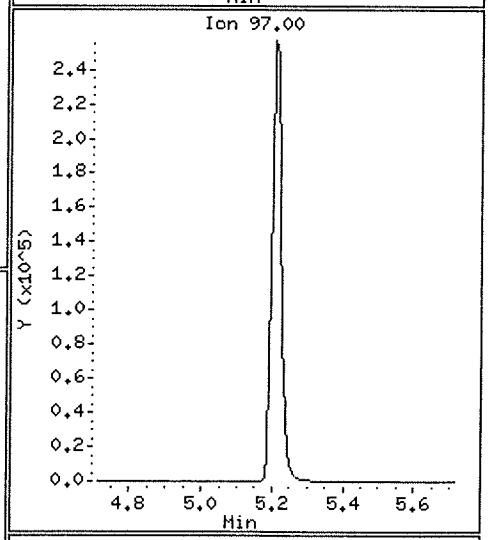
38 Trichloroethene

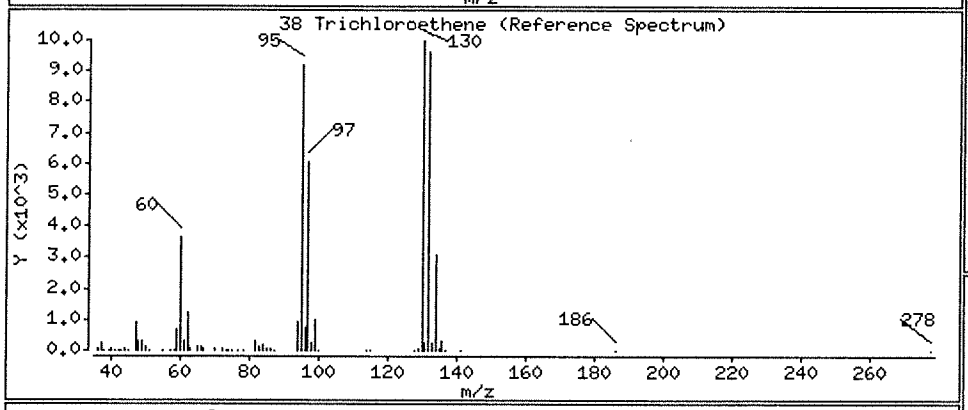
Concentration: 1248.32 ug/l

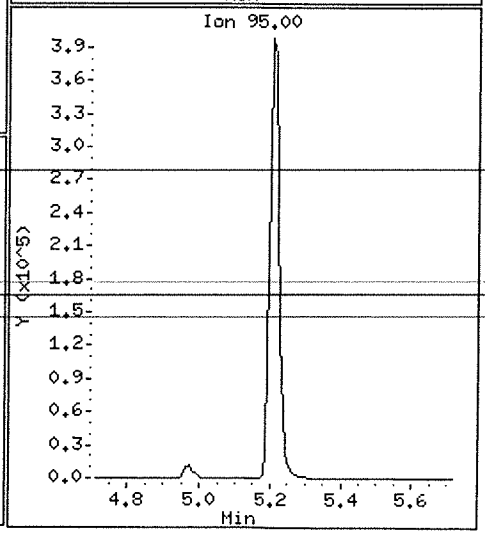


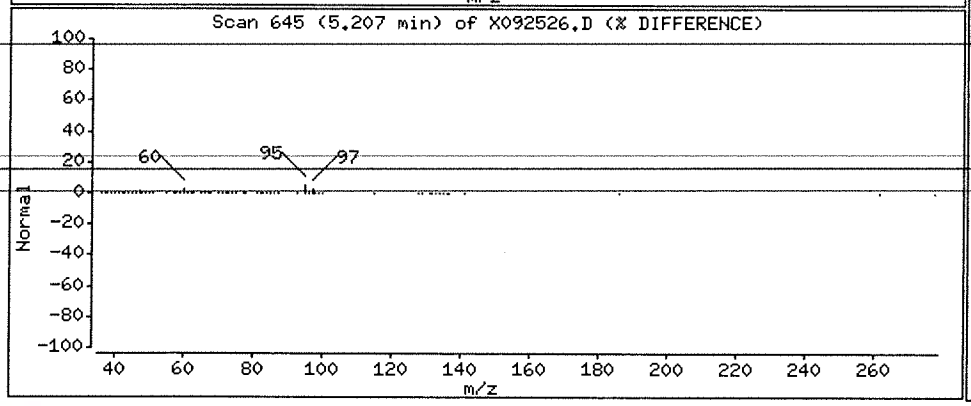












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092526.D

Date : 25-SEP-2019 20:14

Client ID: HS19090860-07

Instrument: voa6.i

Sample Info: HS19090860-07;HS19090860-07;;;

Purge Volume: 5.0

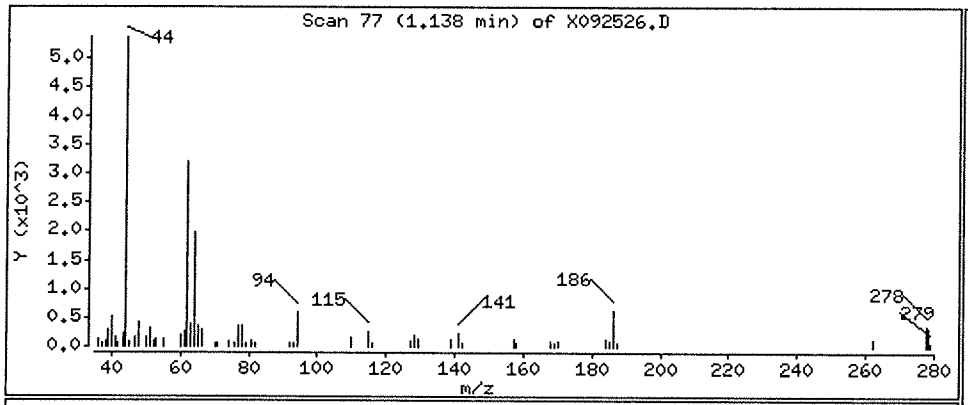
Operator: PC

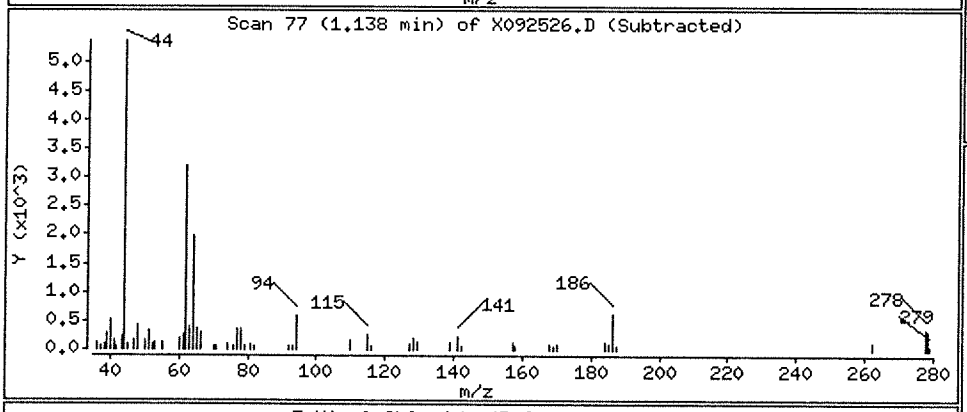
Column phase: DB624

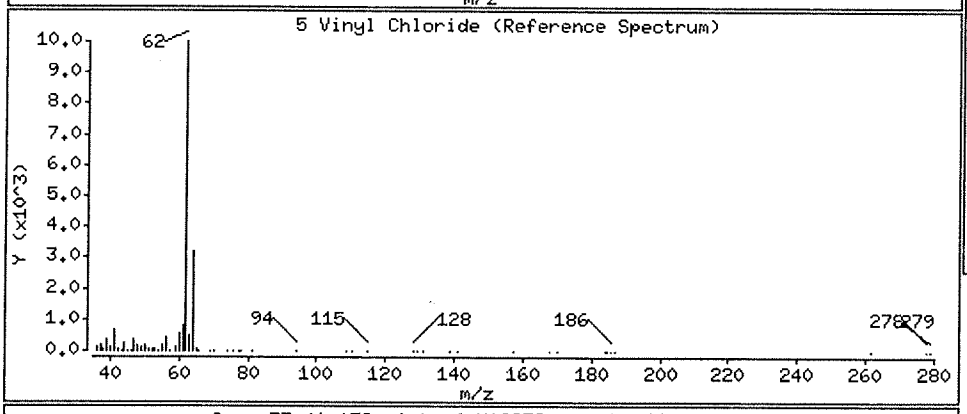
Column diameter: 0.18

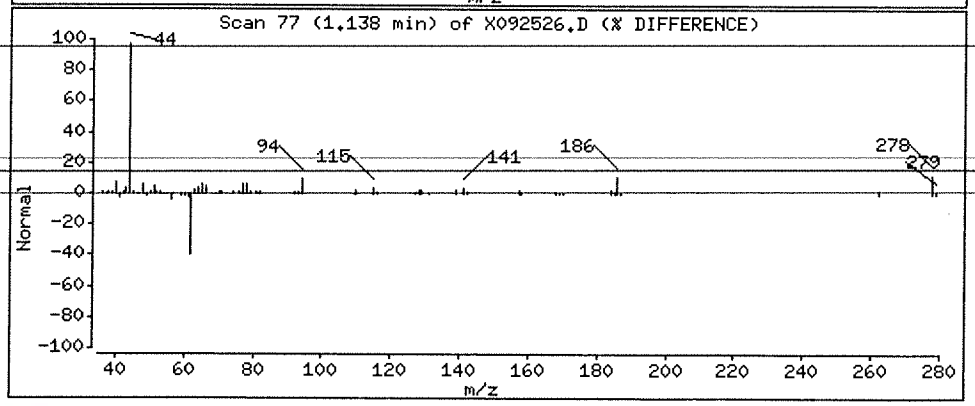
5 Vinyl Chloride

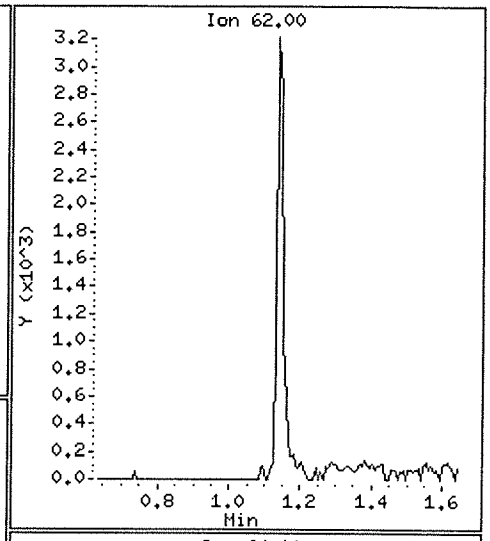
Concentration: 6.22 ug/l

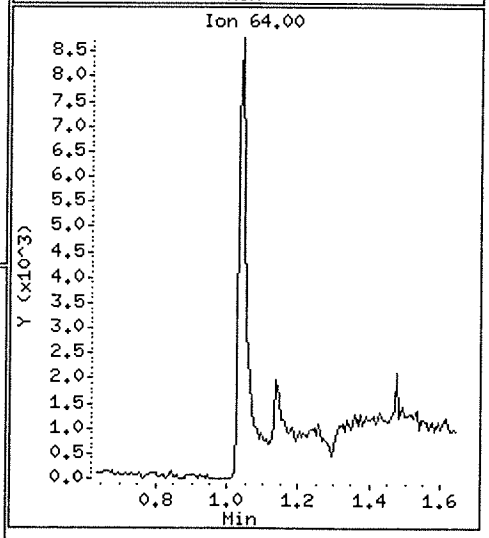












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092527.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092527.D
Lab Smp Id: HS19090860-07 Client Smp ID: HS19090860-07
Inj Date : 25-SEP-2019 20:38
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-07;HS19090860-07;;;
Misc Info : HS18090001;WATER;0;100;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 26
Dil Factor: 100.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	100.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.844)	7426	1.10005	110.00(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	84840	13.6665	1366.65
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	278633	44.6999	44.69
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	358564	53.5888	53.58
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	247734	46.3429	46.34
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	955706	48.4320	48.43
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	546818	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	809871	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	702270	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	379587	50.0000	

QC Flag Legend

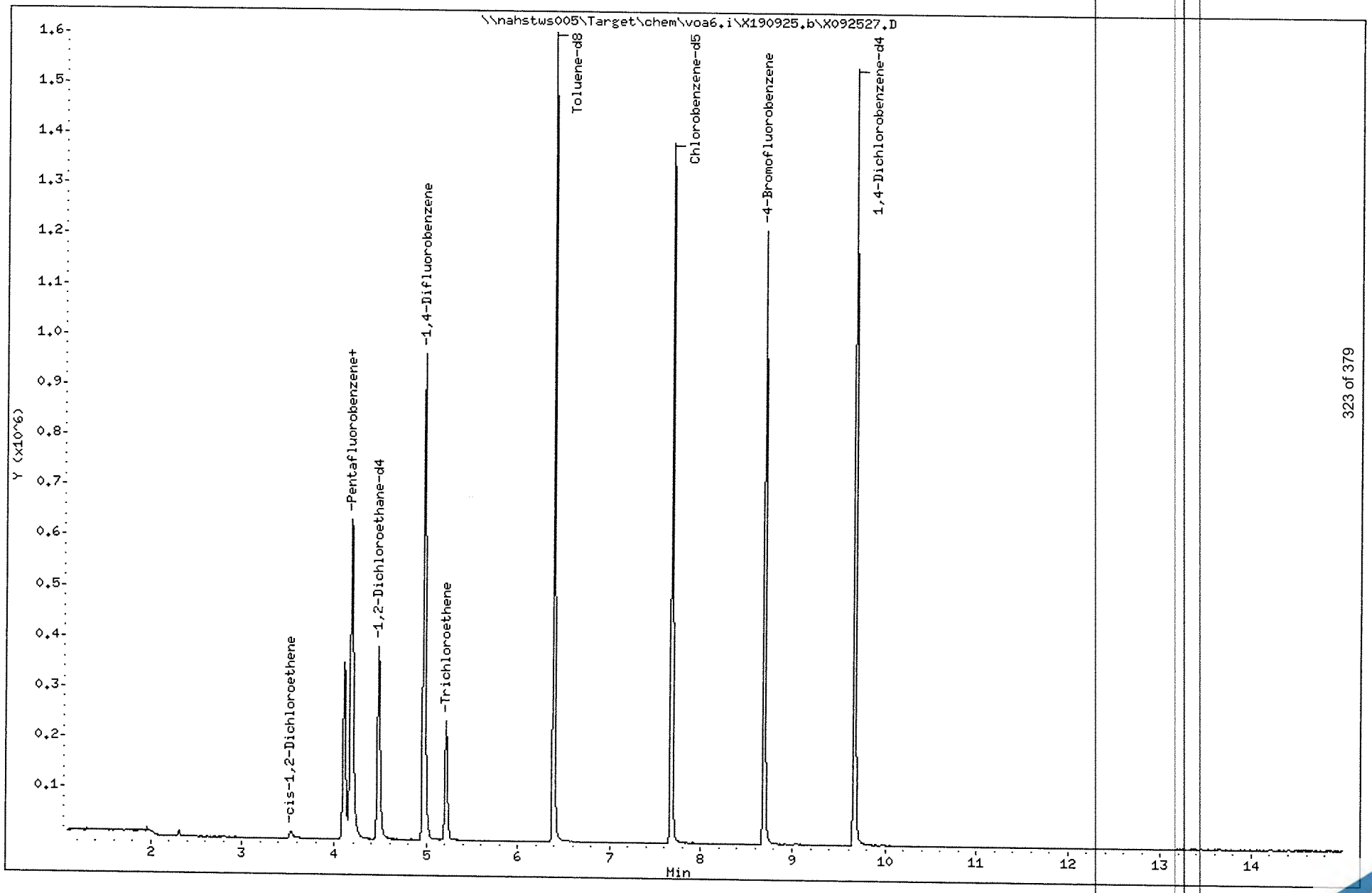
a - Target compound detected but, quantitated amount
Below Limit Of Quantitation(BLOQ).

01030082

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092527.D
Date : 25-SEP-2019 20:38
Client ID: HS19090860-07
Sample Info: HS19090860-07;HS19090860-07;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i

Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092527.D

Date : 25-SEP-2019 20:38

Client ID: HS19090860-07

Instrument: voa6.i

Sample Info: HS19090860-07;HS19090860-07;;;

Purge Volume: 5.0

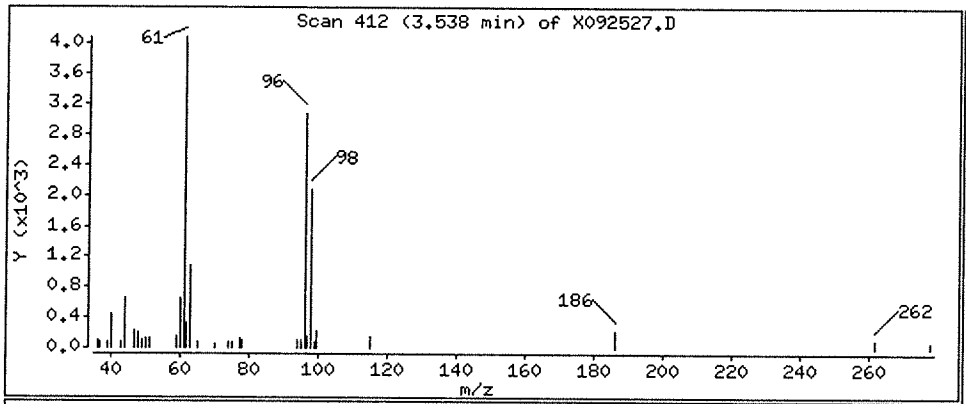
Operator: PC

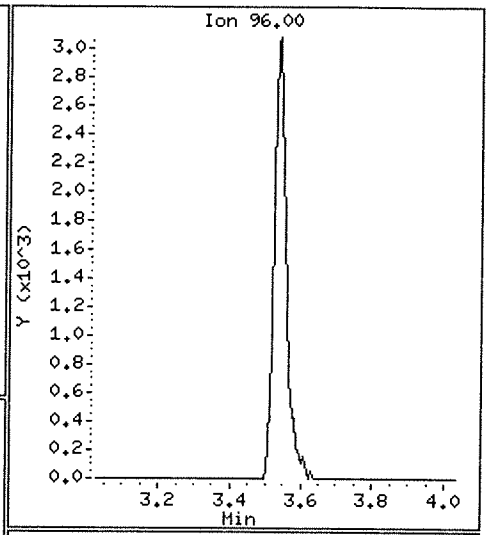
Column phase: DB624

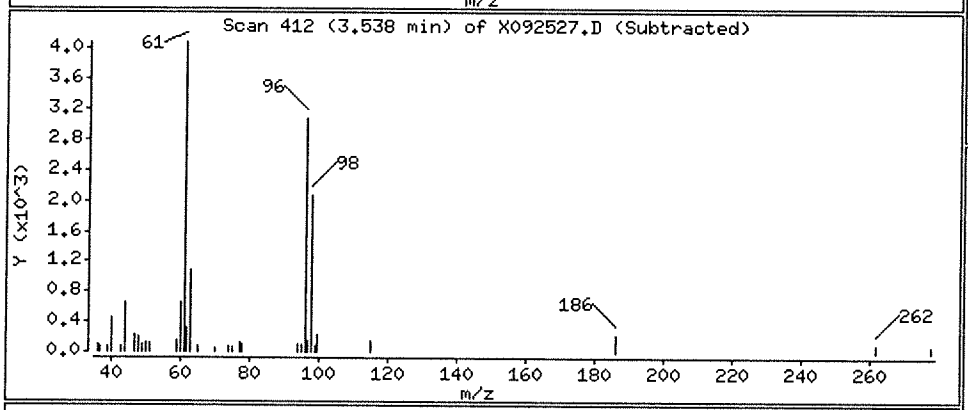
Column diameter: 0.18

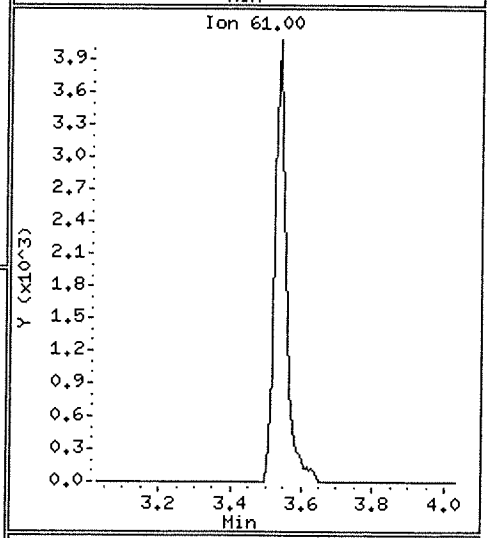
27 cis-1,2-Dichloroethene

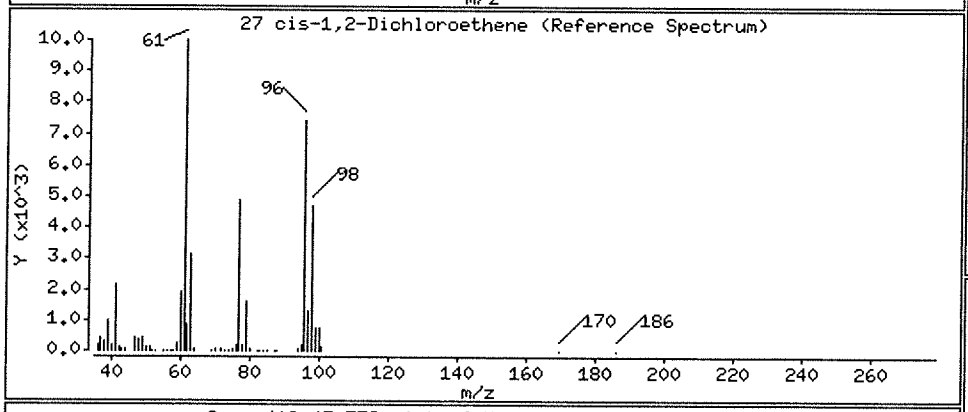
Concentration: 110.00 ug/l

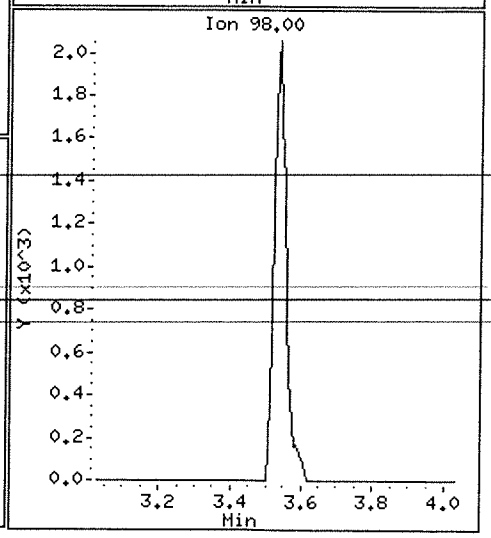


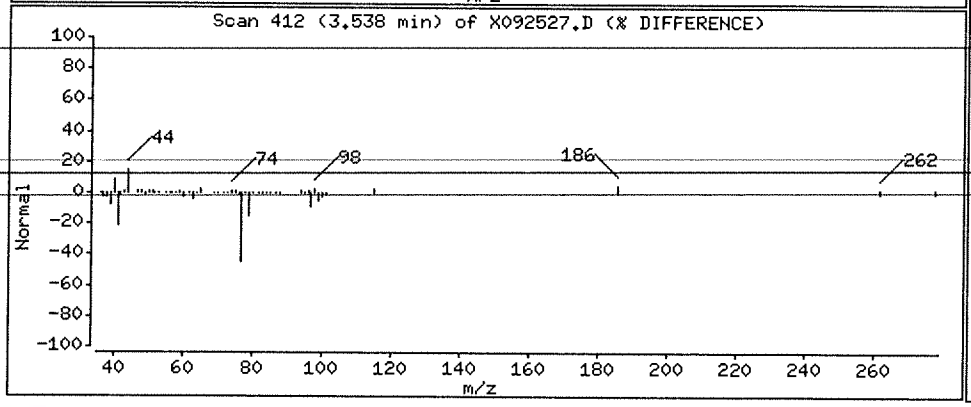












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092527.D

Date : 25-SEP-2019 20:38

Client ID: HS19090860-07

Instrument: voa6.i

Sample Info: HS19090860-07;HS19090860-07;;;

Purge Volume: 5.0

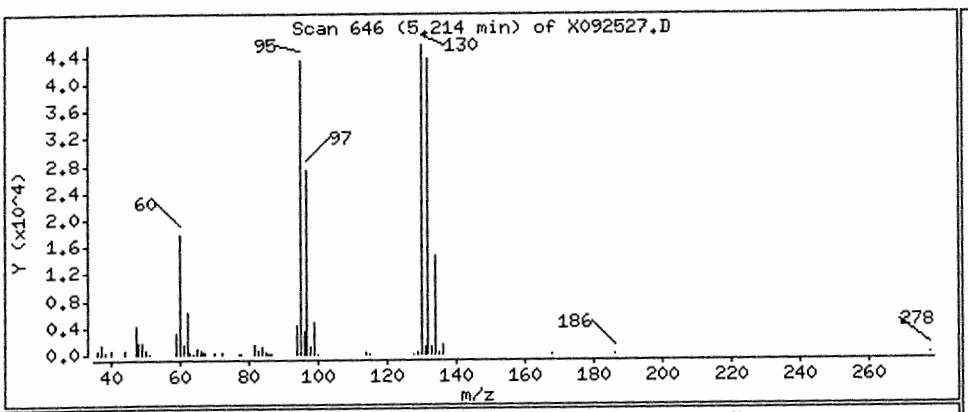
Operator: PC

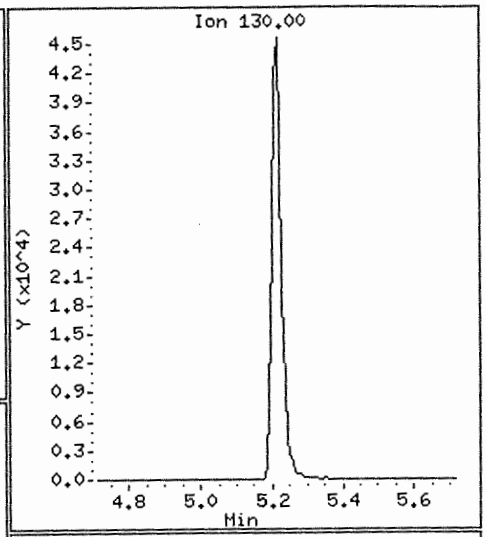
Column phase: DB624

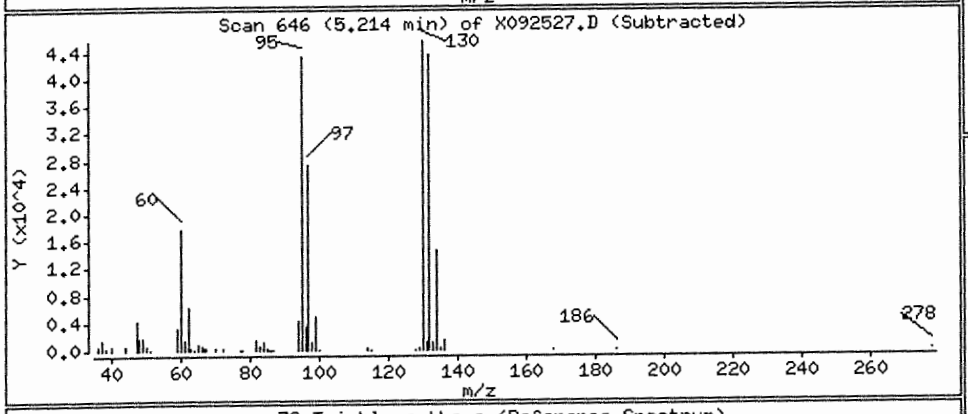
Column diameter: 0.18

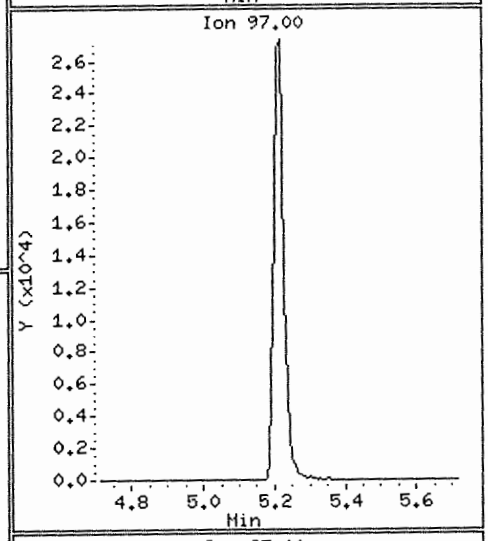
38 Trichloroethene

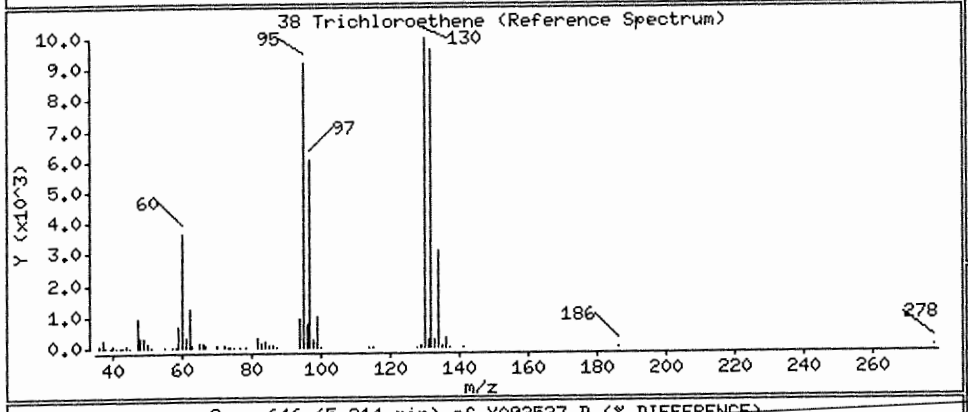
Concentration: 1366.65 ug/l

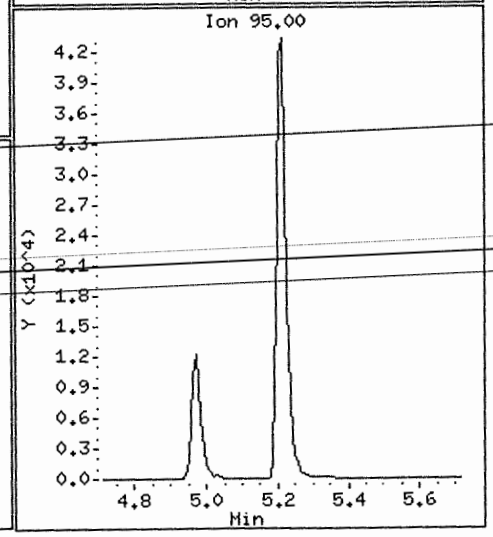


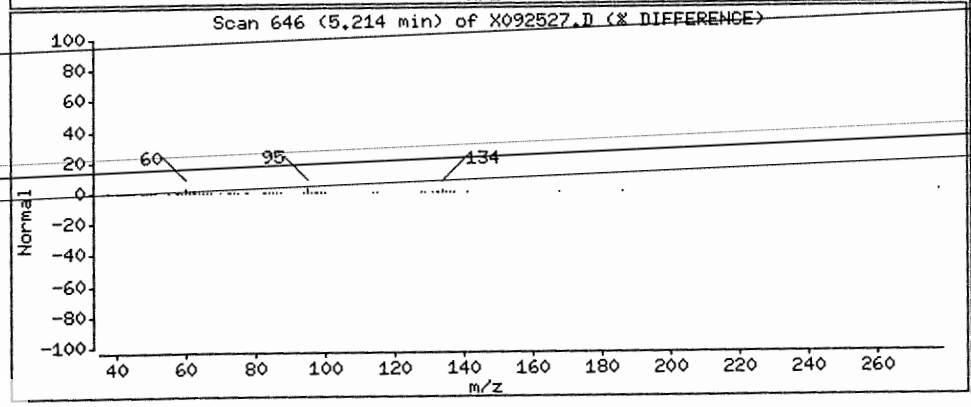












File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D Page 1
rt Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D
Lab Smp Id: HS19090860-10 Client Smp ID: HS19090860-10
Inj Date : 25-SEP-2019 21:02
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-10;HS19090860-10;;;
Misc Info : HS18090001;WATER;0;10;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 27
Dil Factor: 10.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	10.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
11 1,1-Dichloroethene	96	1.919	1.912	(0.458)	4203	0.91022	9.10(a)
33 1,2-Dichloroethane	62	4.569	4.562	(0.919)	3844	0.53077	5.30(a)
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	202541	30.7663	307.66
38 Trichloroethene	130	5.214	5.214	(1.049)	1700449	285.208	2852.07(A)
5 Vinyl Chloride	62	1.138	1.138	(0.272)	25270	3.74359	37.43(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	273587	45.0132	45.01
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	319384	52.1214	52.12
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	243615	46.7384	46.73
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	901906	49.9381	49.93
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	533258	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	777814	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.671	(1.000)	642749	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	323340	50.0000	

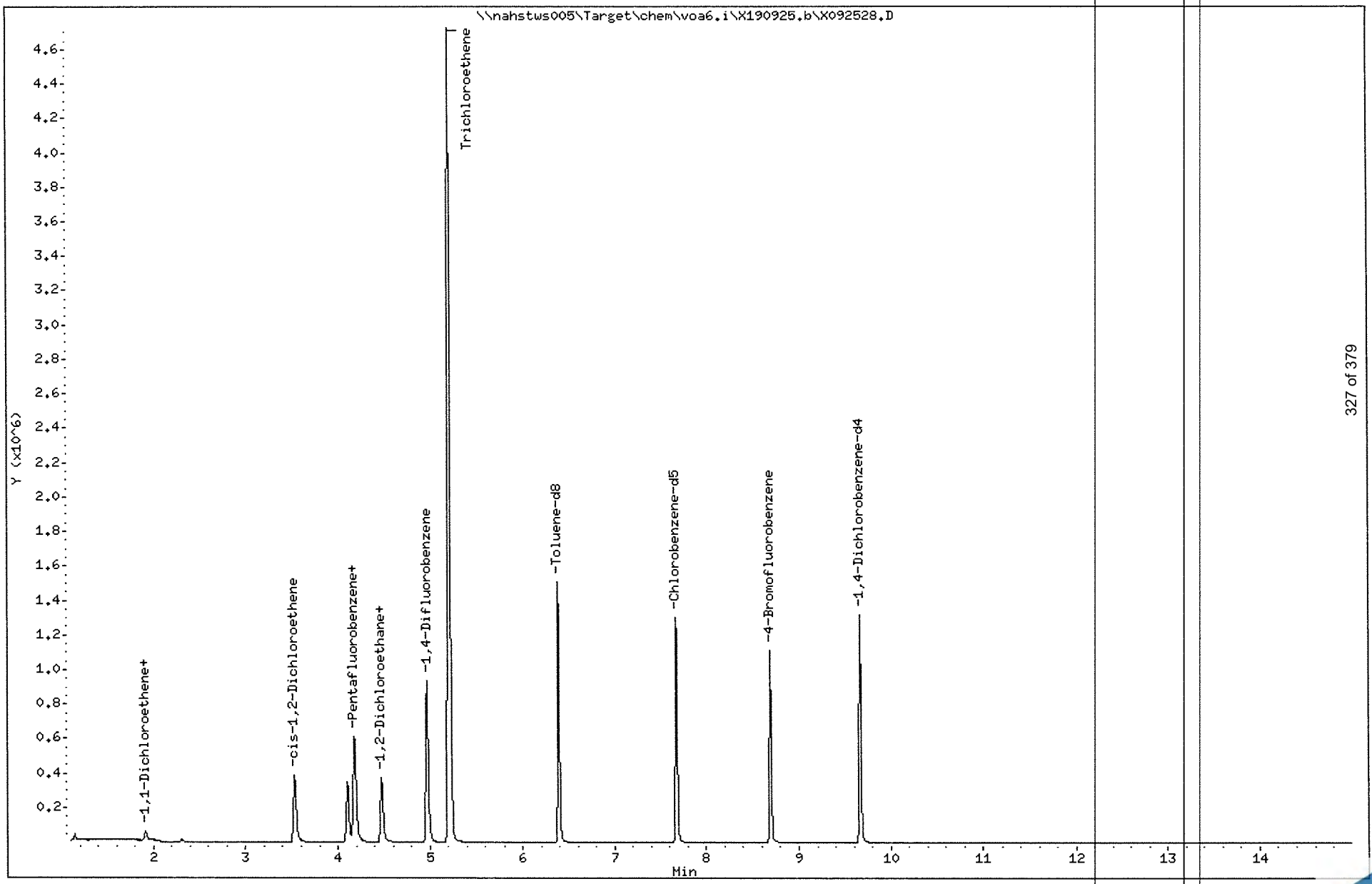
QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).
A - Target compound detected but, quantitated amount exceeded maximum amount.

01030086

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D
Date : 25-SEP-2019 21:02
Client ID: HS19090860-10
Sample Info: HS19090860-10;HS19090860-10;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D

Date : 25-SEP-2019 21:02

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

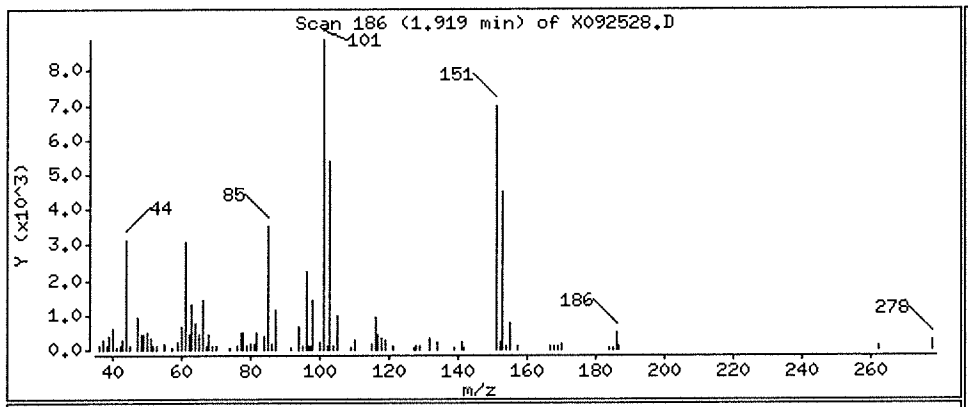
Operator: PC

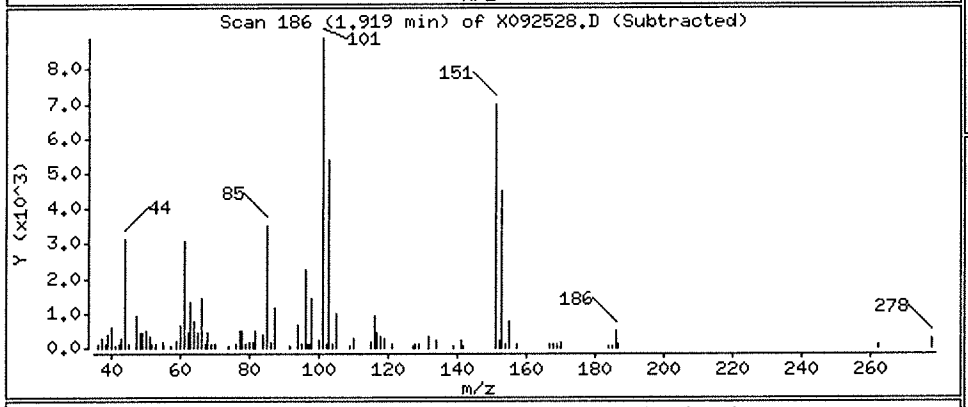
Column phase: DB624

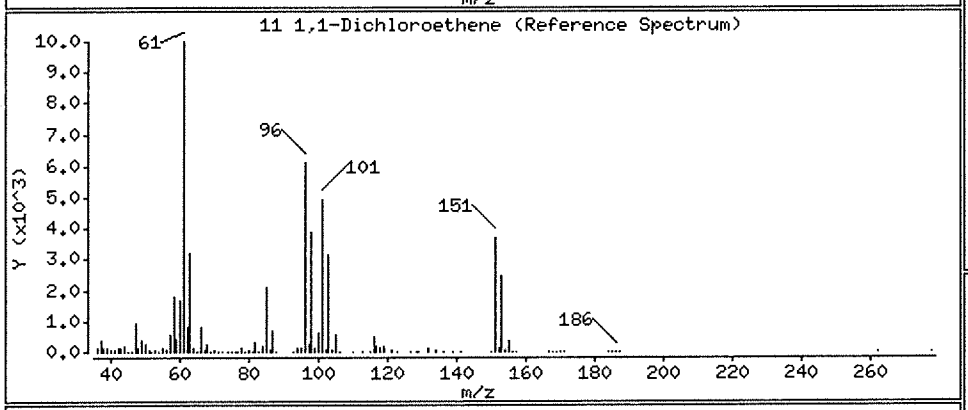
Column diameter: 0.18

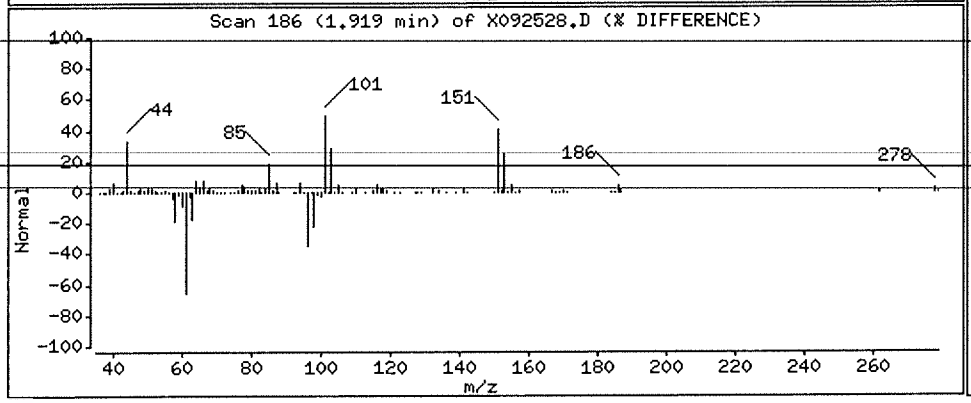
11 1,1-Dichloroethene

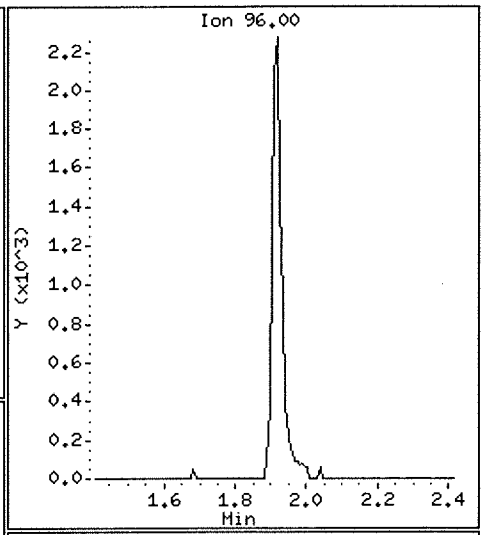
Concentration: 9.10 ug/l

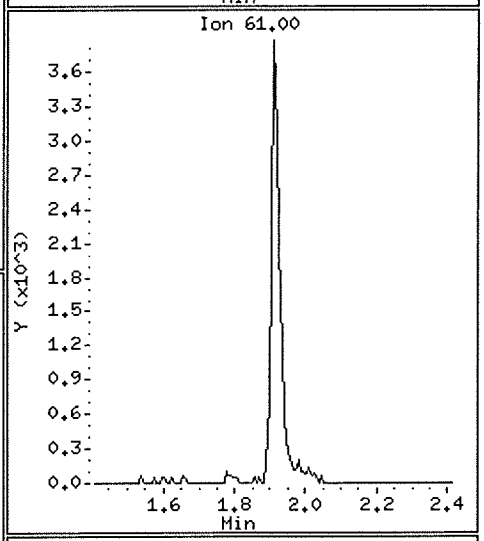


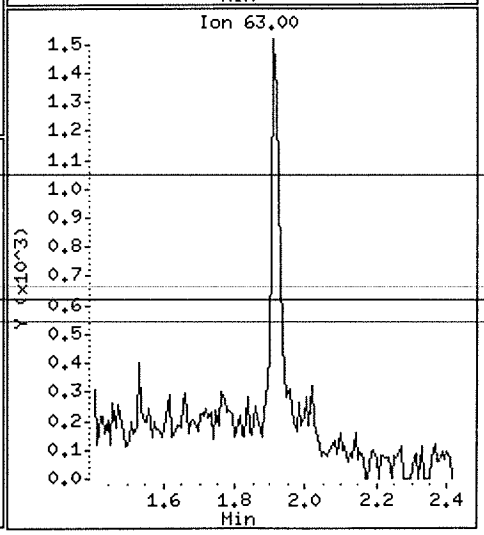












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D Page 4

Date : 25-SEP-2019 21:02

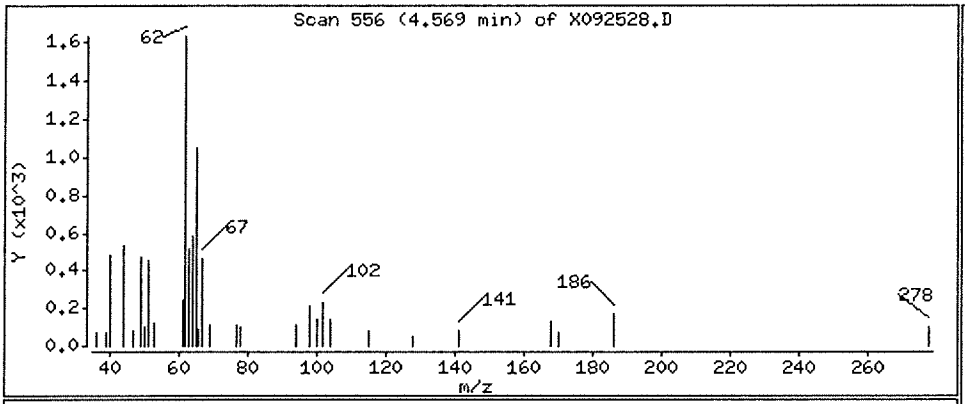
Client ID: HS19090860-10 Instrument: voa6.i

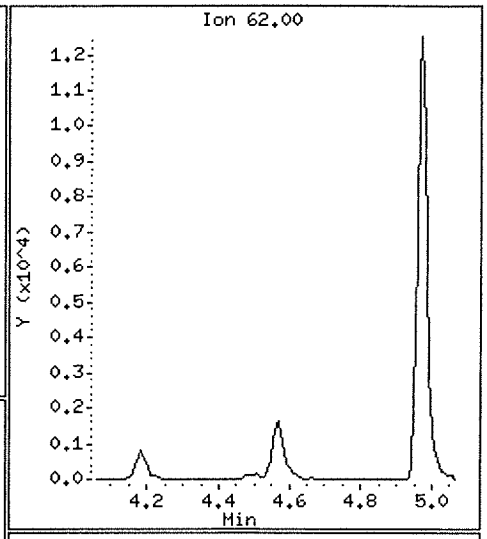
Sample Info: HS19090860-10;HS19090860-10;;;

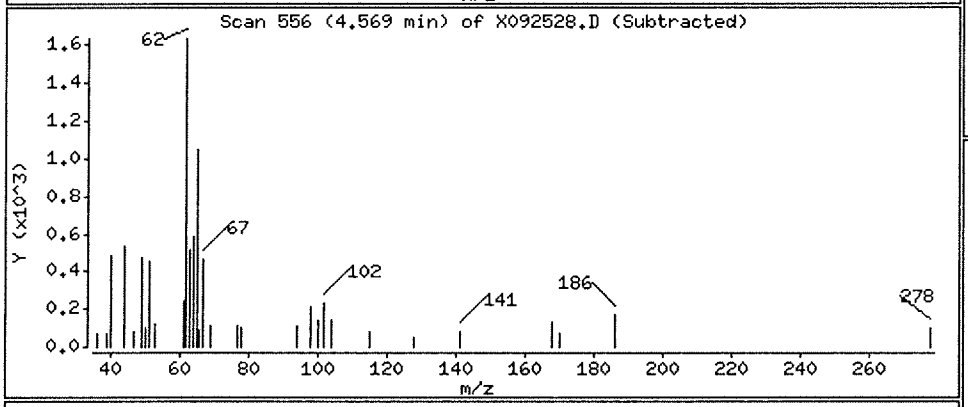
Purge Volume: 5.0 Operator: PC

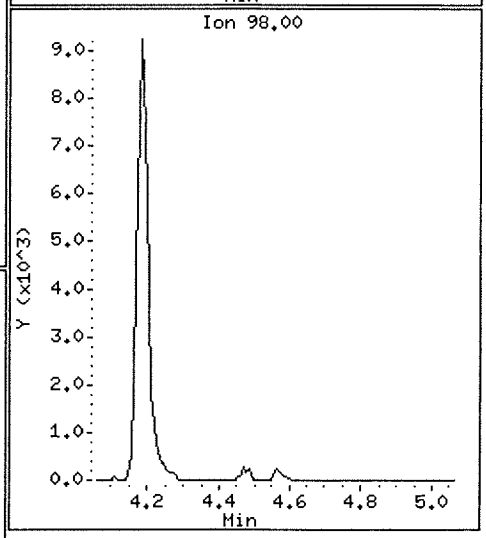
Column phase: DB624 Column diameter: 0.18

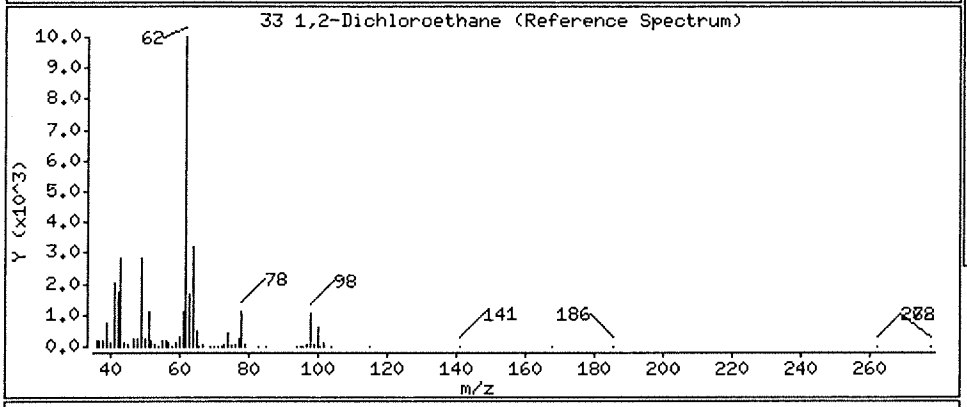
33 1,2-Dichloroethane Concentration: 5.30 ug/l

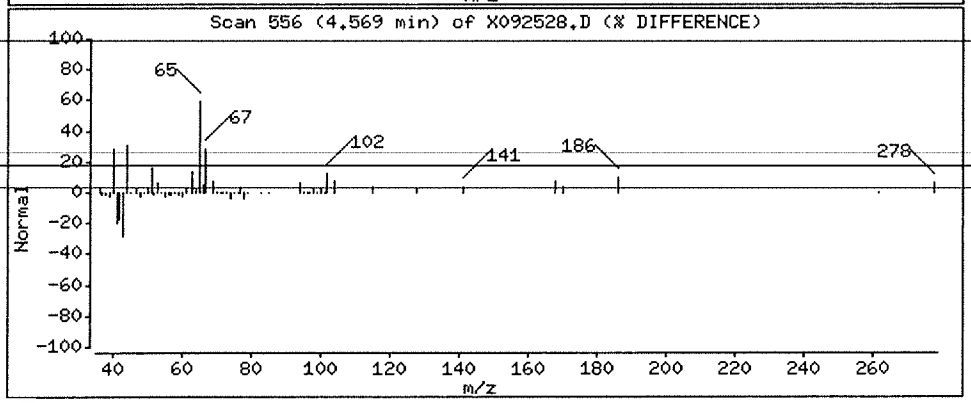












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D

Date : 25-SEP-2019 21:02

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

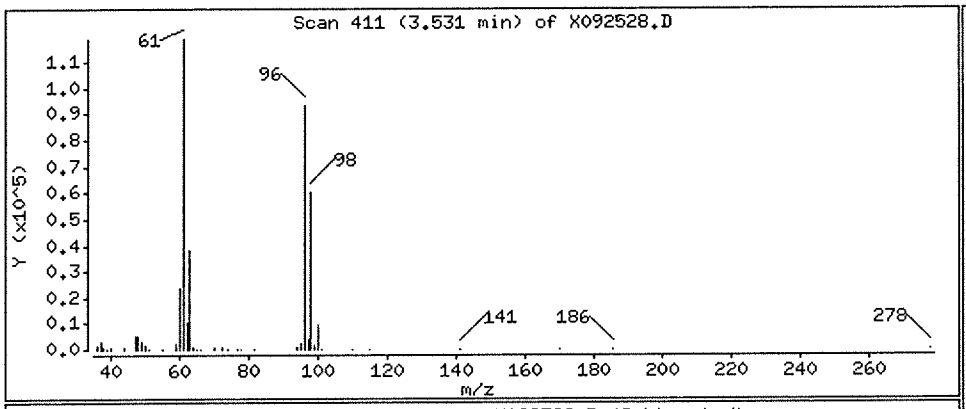
Operator: PC

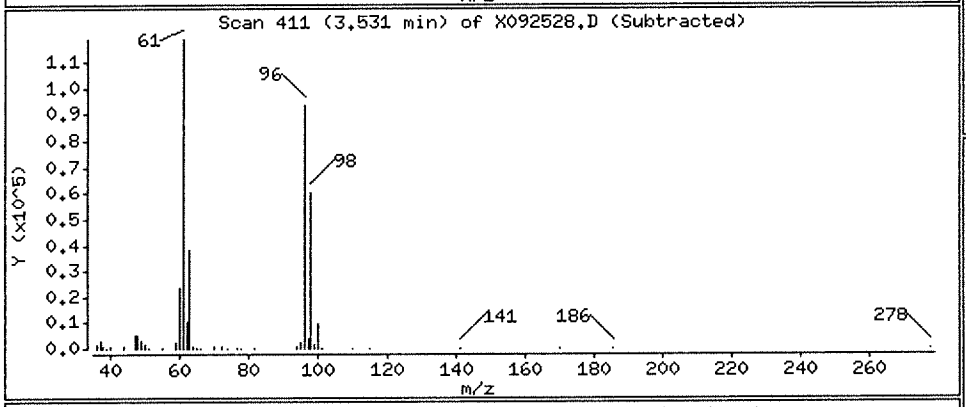
Column phase: DB624

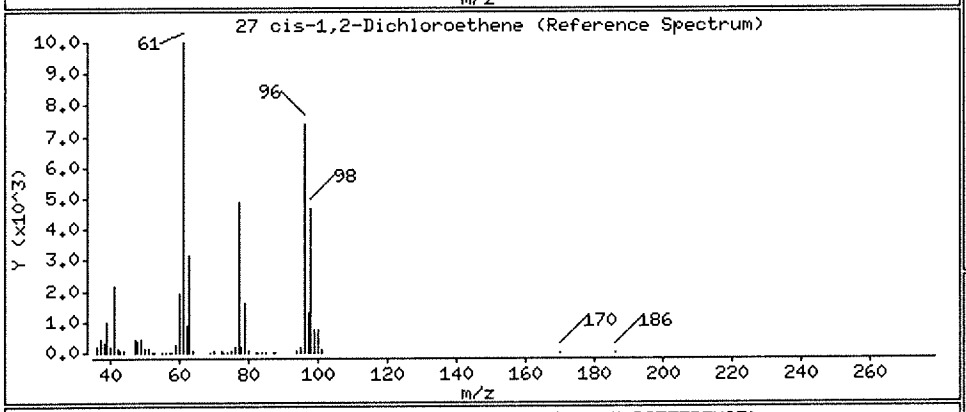
Column diameter: 0.18

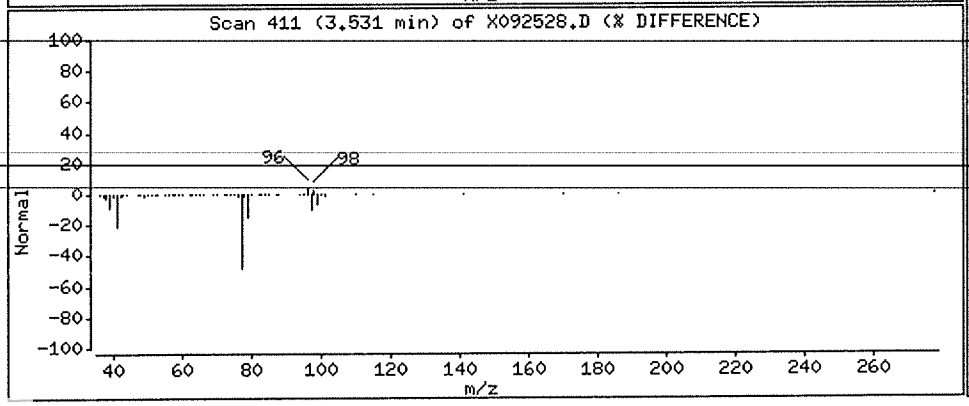
27 cis-1,2-Dichloroethene

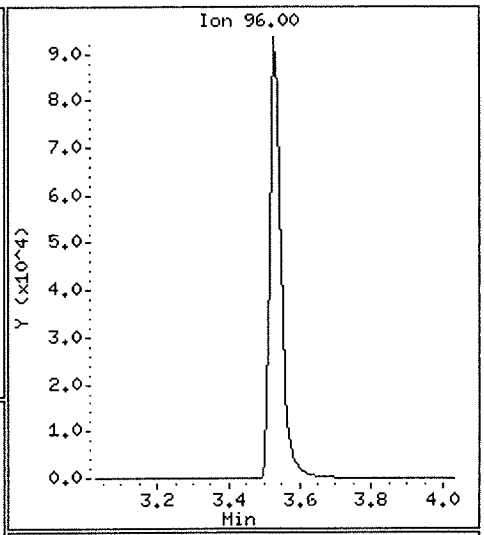
Concentration: 307.66 ug/l

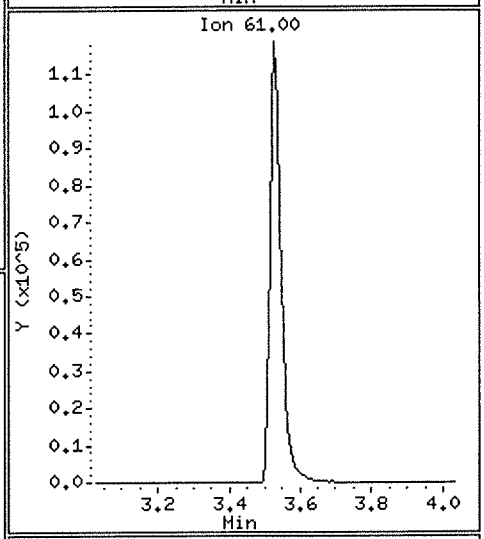


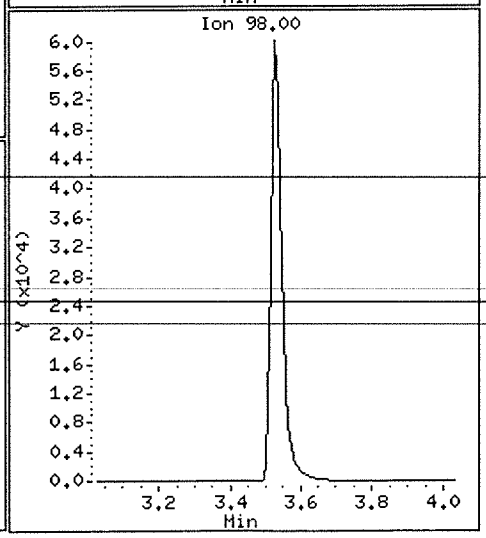












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D

Date : 25-SEP-2019 21:02

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

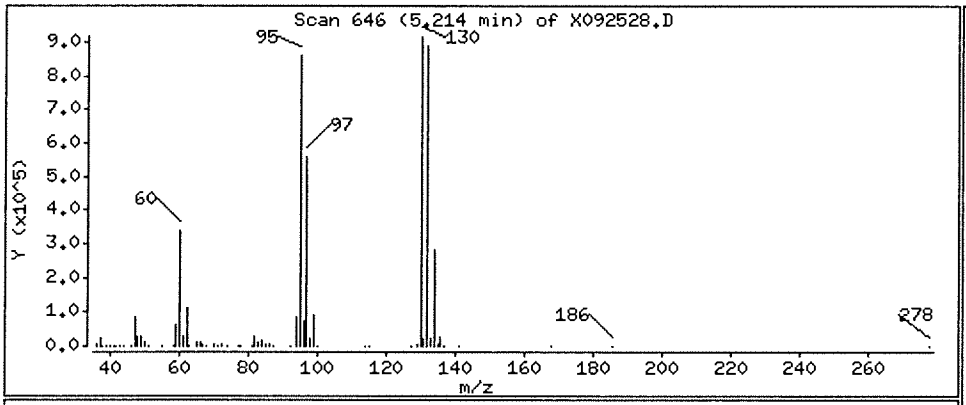
Operator: PC

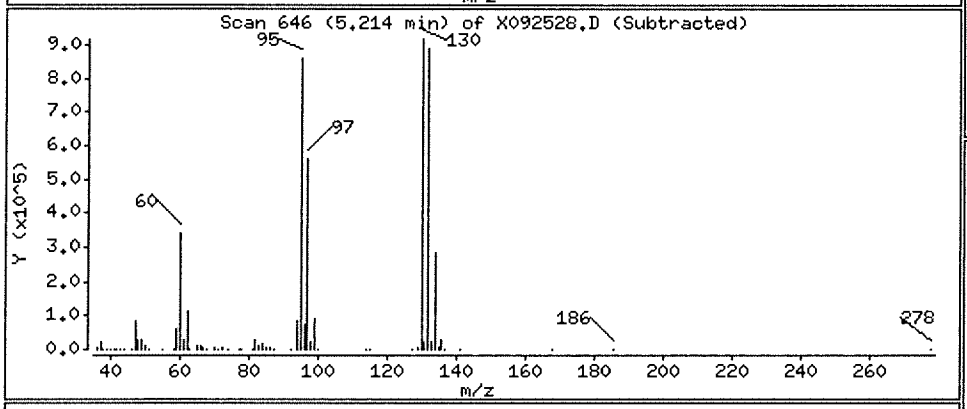
Column phase: DB624

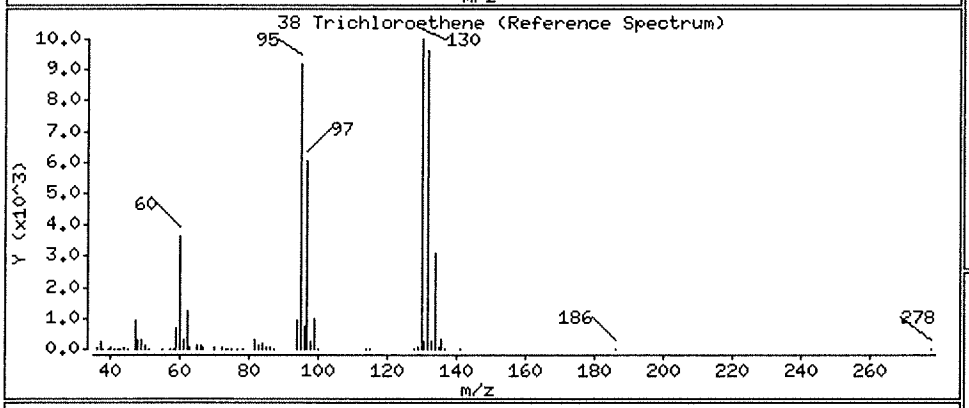
Column diameter: 0.18

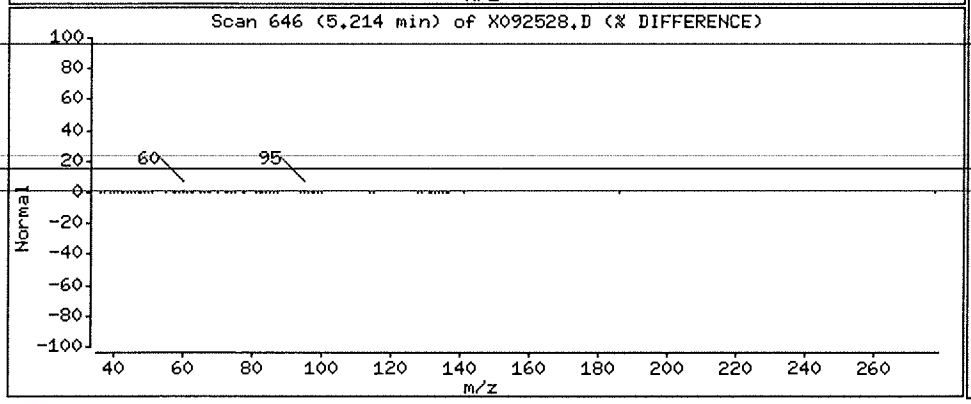
38 Trichloroethene

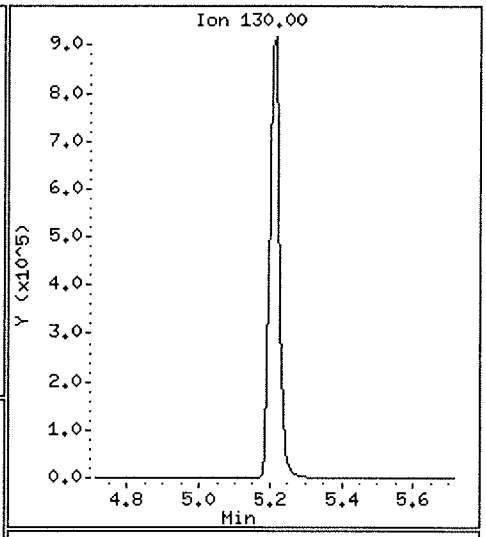
Concentration: 2852.07 ug/l

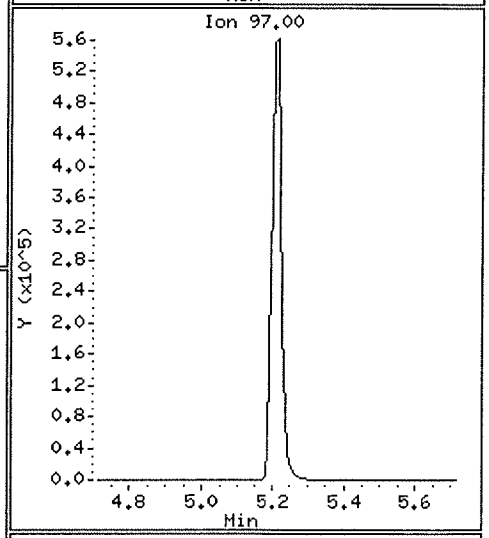


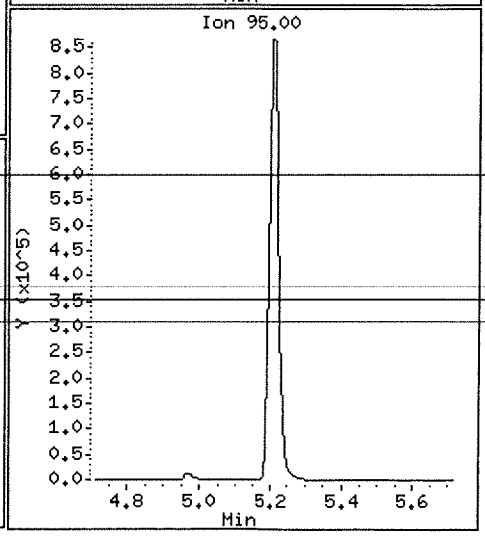












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092528.D

Date : 25-SEP-2019 21:02

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

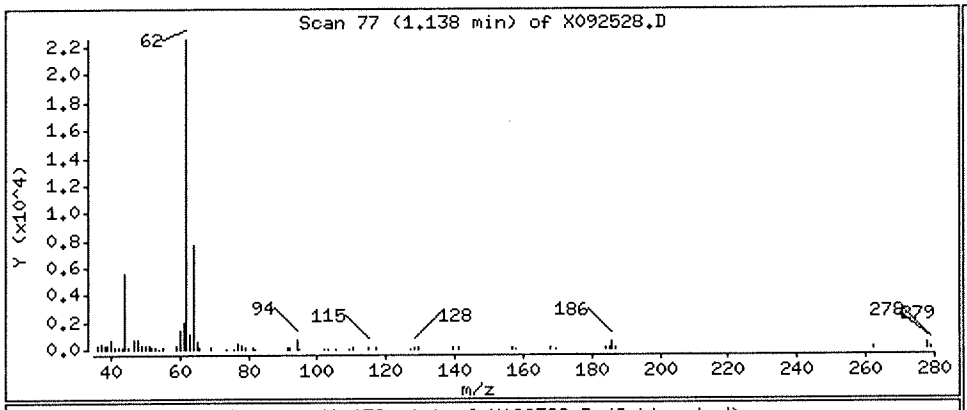
Operator: PC

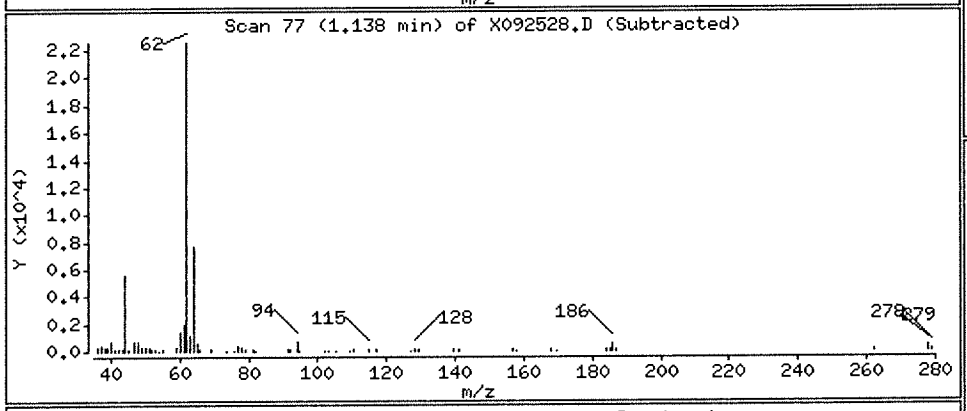
Column phase: DB624

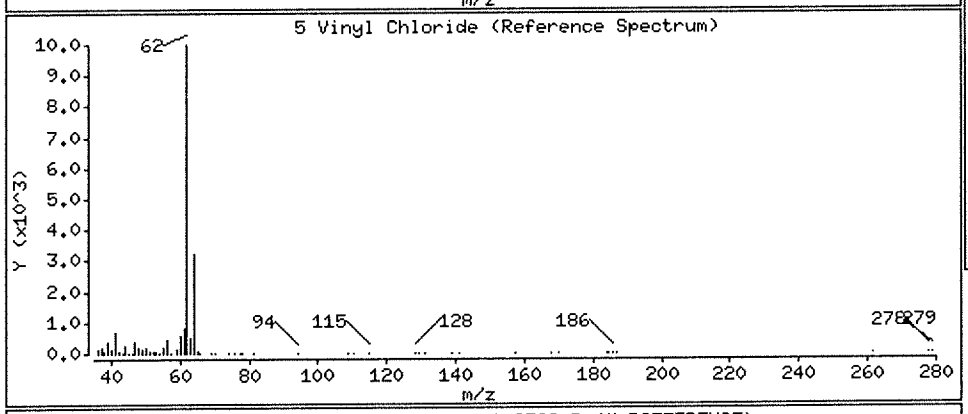
Column diameter: 0.18

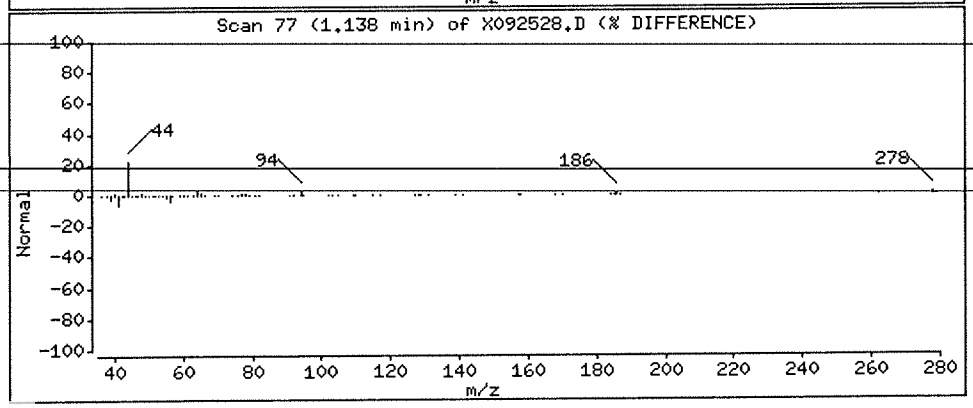
5 Vinyl Chloride

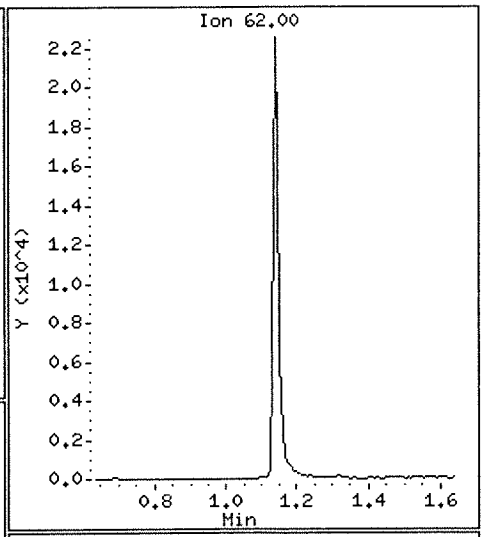
Concentration: 37.43 ug/l

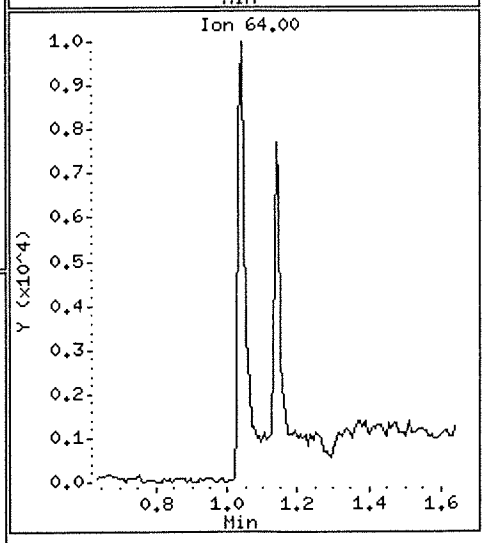












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D Page 1
Report Date: 11-Oct-2019 08:00

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D
Lab Smp Id: HS19090860-10 Client Smp ID: HS19090860-10
Inj Date : 25-SEP-2019 21:26
Operator : PC Inst ID: voa6.i
Smp Info : HS19090860-10;HS19090860-10;;;
Misc Info : HS18090001;WATER;0;100;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 28
Dil Factor: 100.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	100.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
27 cis-1,2-Dichloroethene	96	3.537	3.530	(0.846)	21244	3.15480	315.48(a)
38 Trichloroethene	130	5.214	5.214	(1.049)	197020	32.3051	3230.51
5 Vinyl Chloride	62	1.138	1.138	(0.272)	3424	0.49589	49.58(a)
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	276584	44.4767	44.47
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	336333	51.8657	51.86
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	248844	46.6723	46.67
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	940456	49.2113	49.21
* 1 Pentafluorobenzene	168	4.182	4.189	(1.000)	545462	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	795632	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	680120	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	355062	50.0000	

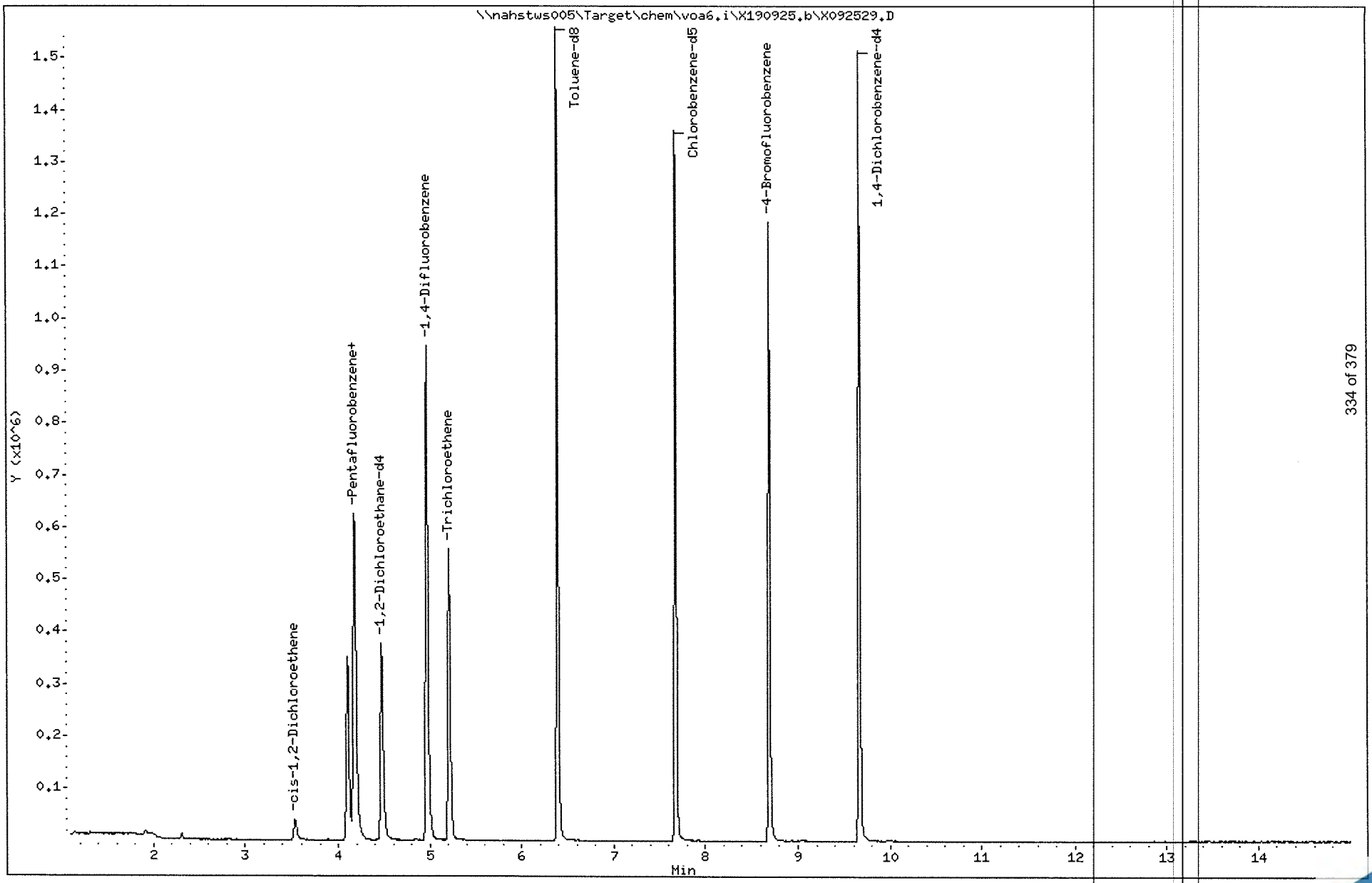
QC Flag Legend

a - Target compound detected but, quantitated amount Below Limit Of Quantitation(BLOQ).

01030093

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D
Date : 25-SEP-2019 21:26
Client ID: HS19090860-10
Sample Info: HS19090860-10;HS19090860-10;;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D

Date : 25-SEP-2019 21:26

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

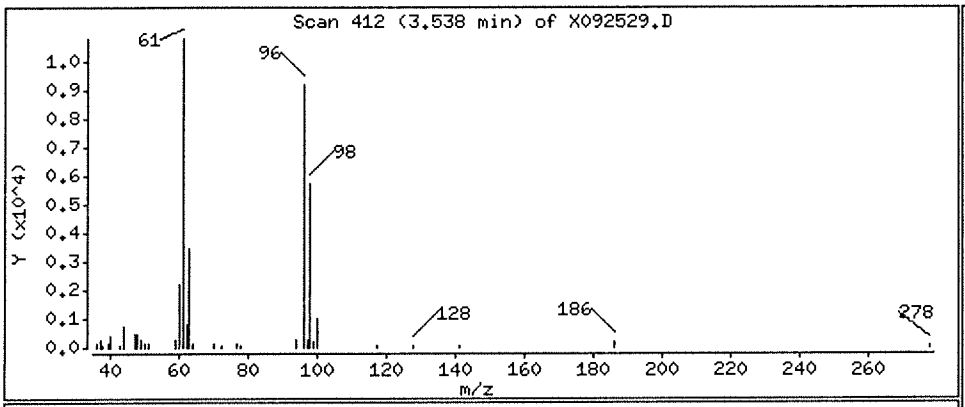
Operator: PC

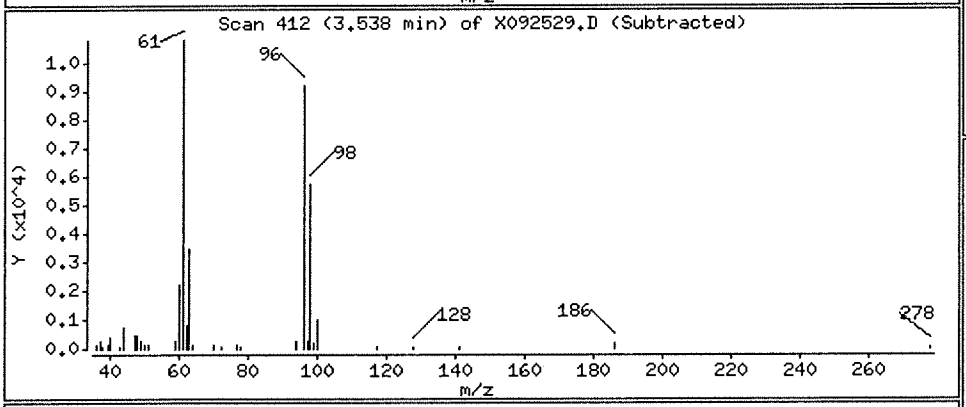
Column phase: DB624

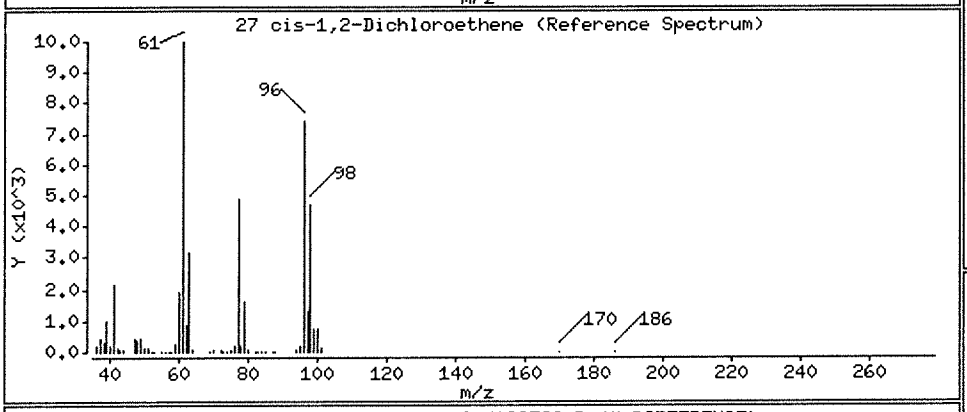
Column diameter: 0.18

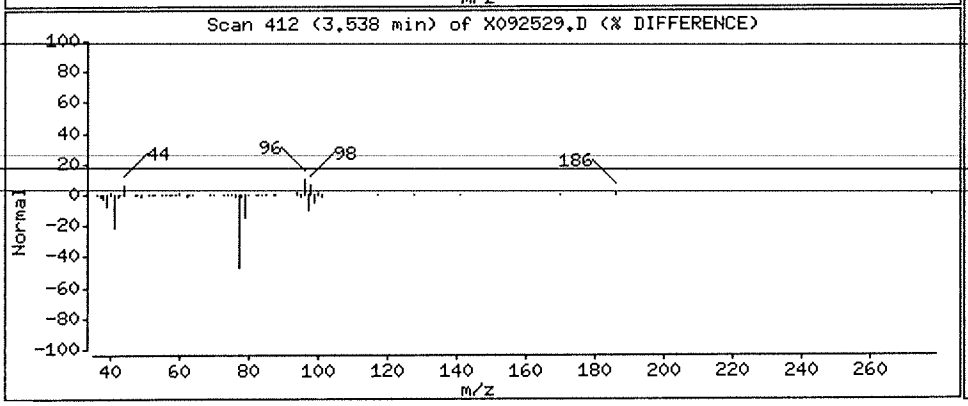
27 cis-1,2-Dichloroethene

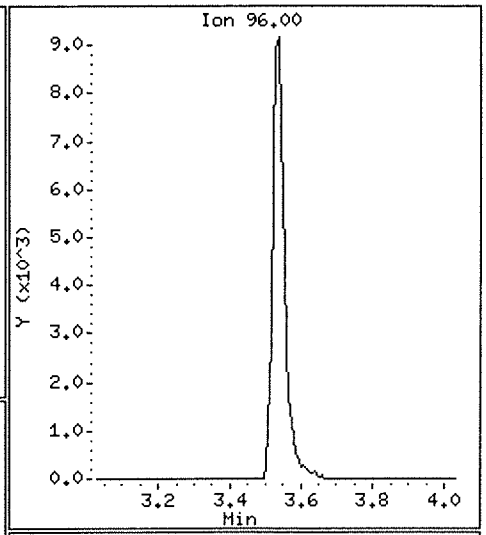
Concentration: 315.48 ug/l

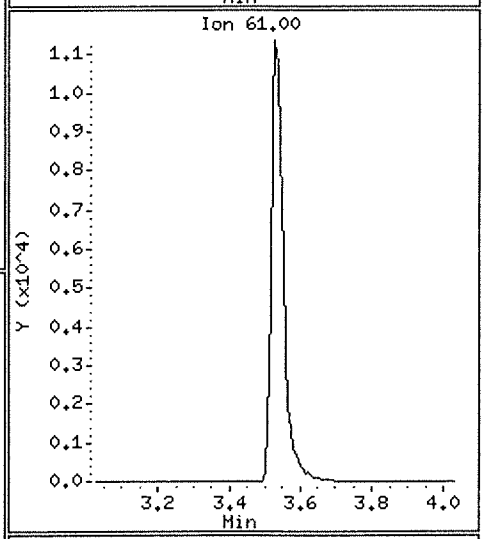


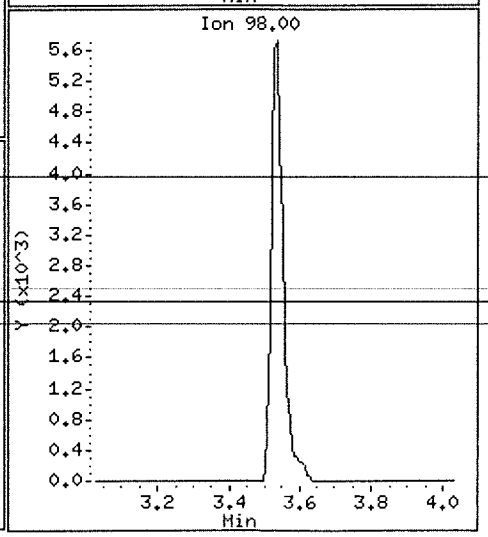












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D

Date : 25-SEP-2019 21:26

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

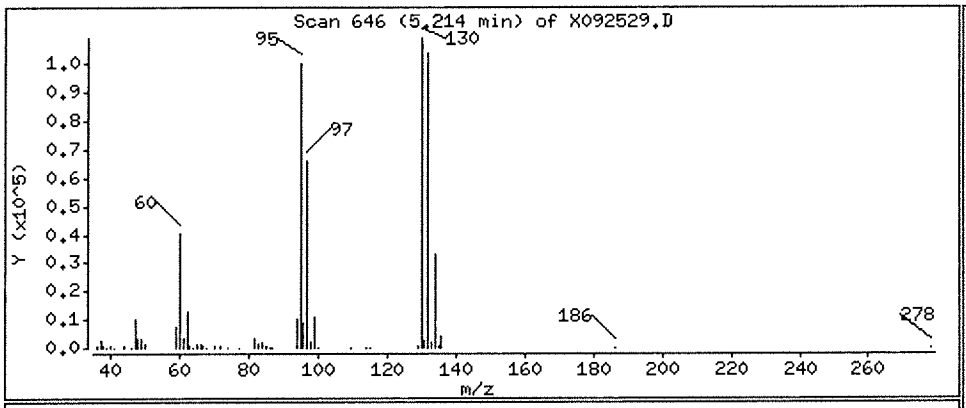
Operator: PC

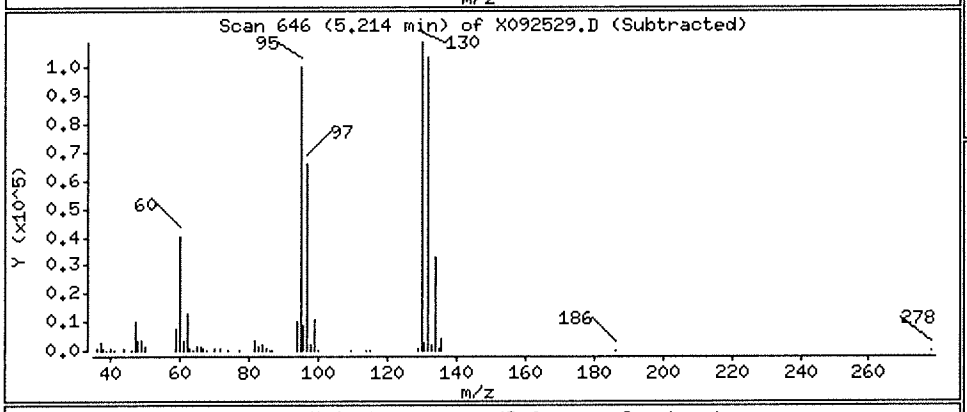
Column phase: DB624

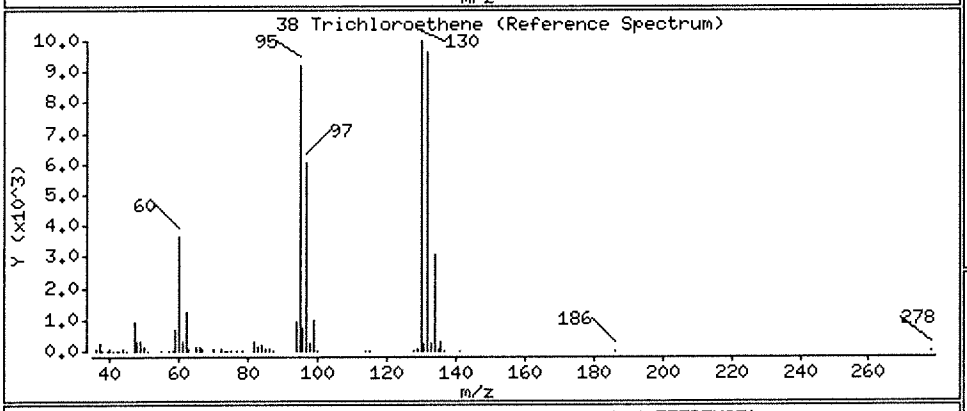
Column diameter: 0.18

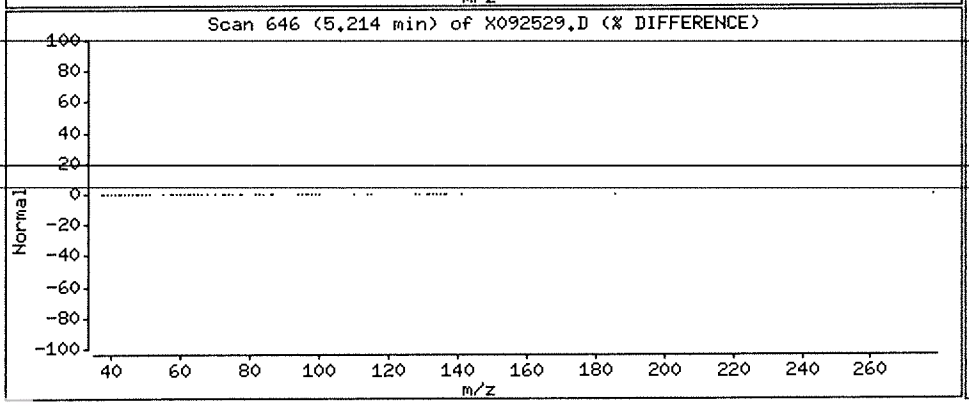
38 Trichloroethene

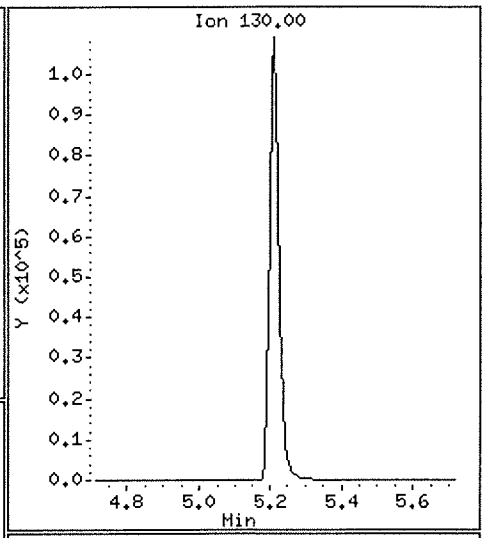
Concentration: 3230.51 ug/l

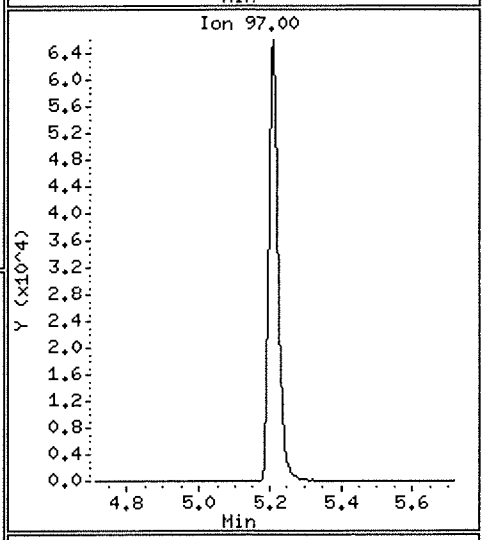


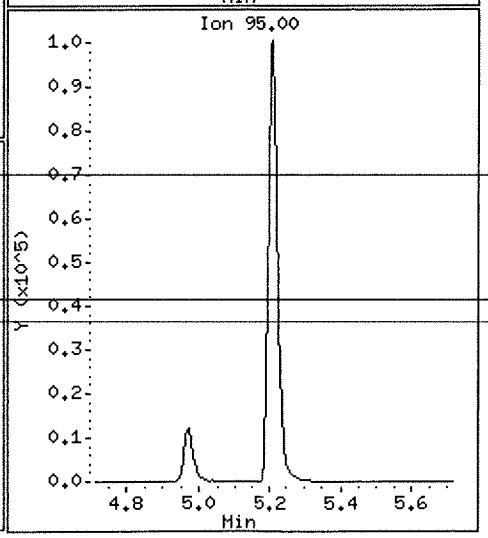












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092529.D

Date : 25-SEP-2019 21:26

Client ID: HS19090860-10

Instrument: voa6.i

Sample Info: HS19090860-10;HS19090860-10;;;

Purge Volume: 5.0

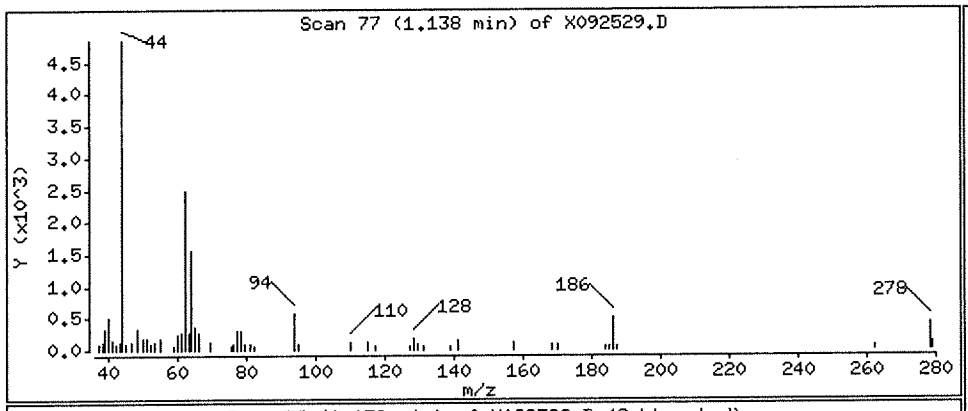
Operator: PC

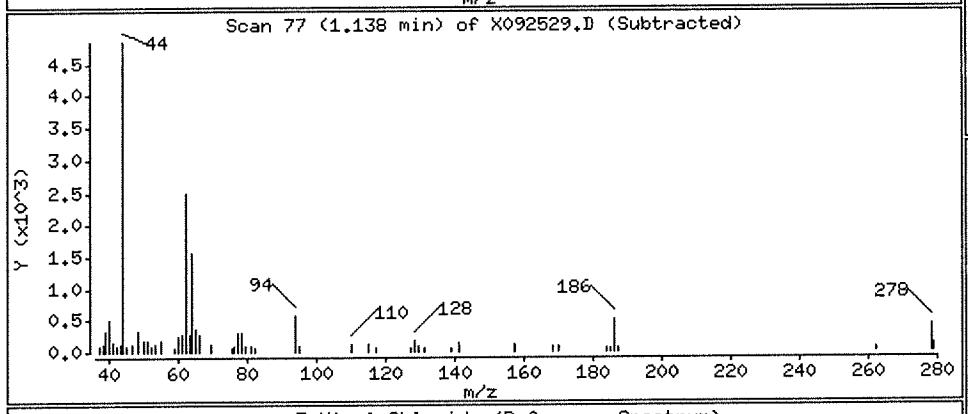
Column phase: DB624

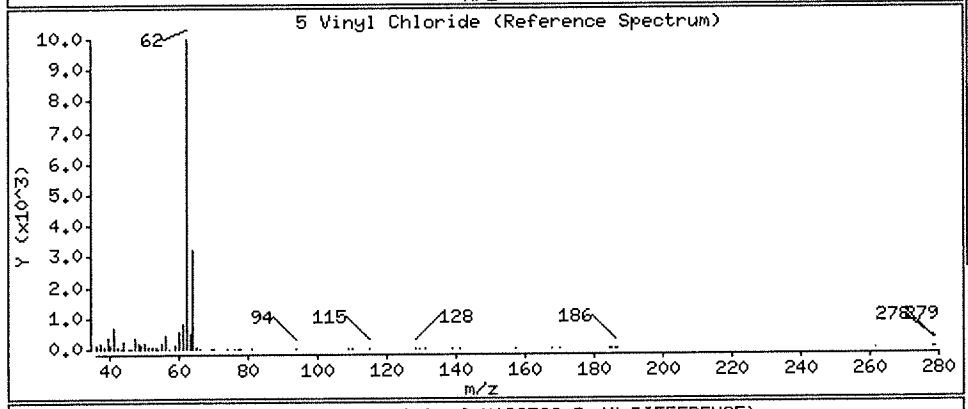
Column diameter: 0.18

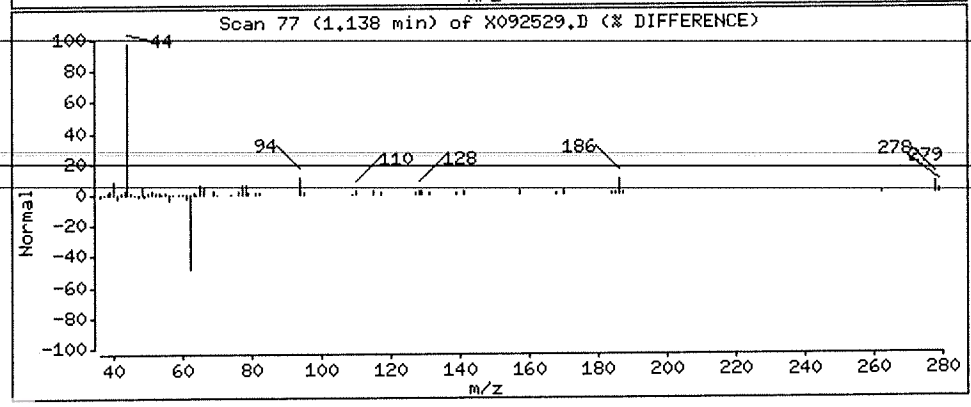
5 Vinyl Chloride

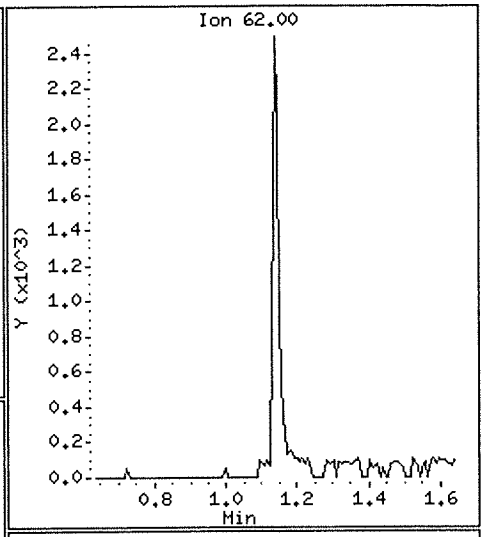
Concentration: 49.58 ug/l

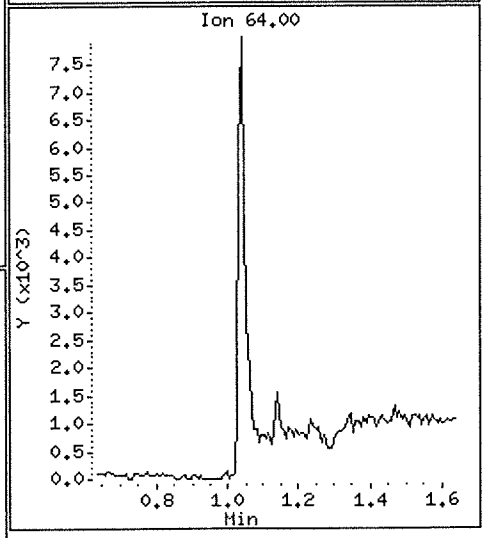












Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092530.D Page 1
Report Date: 11-Oct-2019 08:02

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190925.b\X092530.D
Lab Smp Id: CCV-END Client Smp ID: CCV-END
Inj Date : 25-SEP-2019 21:50
Operator : PC Inst ID: voa6.i
Smp Info : CCV-END;CCV-END;2;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190925.b\8260W.m
Meth Date : 11-Oct-2019 07:59 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 29 Continuing Calibration Sample
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

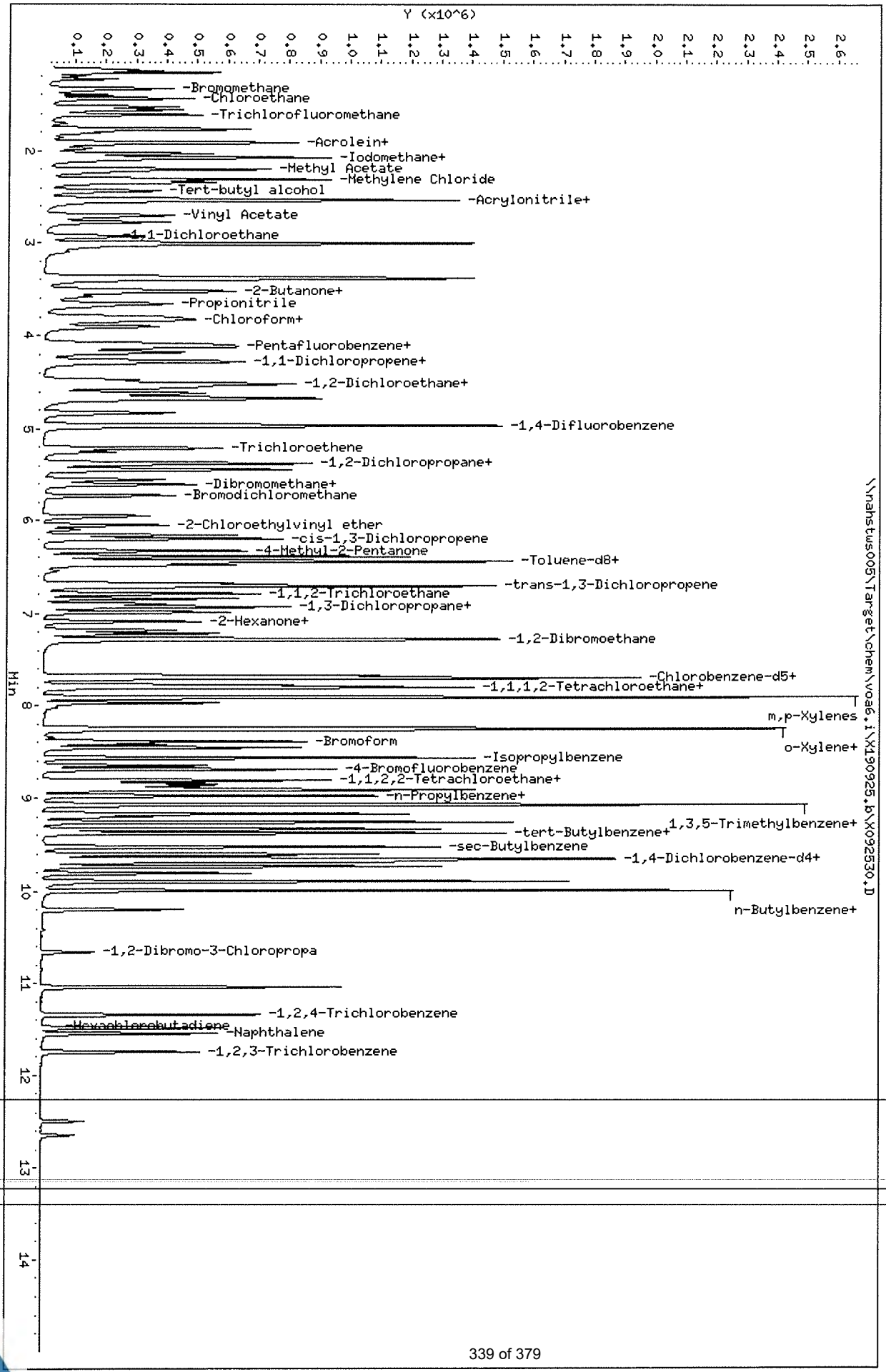
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	153645	50.0000	50.41
11 1,1-Dichloroethene	96	1.912	1.912	(0.456)	159157	50.0000	47.88
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	244350	50.0000	44.68
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	219479	50.0000	46.31
17 Methylene Chloride	84	2.306	2.306	(0.550)	209355	50.0000	50.62
38 Trichloroethene	130	5.214	5.214	(1.049)	206145	50.0000	45.79
5 Vinyl Chloride	62	1.138	1.138	(0.272)	234174	50.0000	48.19
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	220644	50.0000	50.54
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	263985	50.0000	52.13
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	192294	50.0000	51.33
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	699299	50.0000	46.85
* 1 Pentafluorobenzene	168	4.189	4.189	(1.000)	383880	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	587319	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.671	(1.000)	531152	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	274042	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190925.b\X092530.D
Date : 25-SEP-2019 21:50
Client ID: CCV-END
Sample Info: CCV-END;CCV-END;2;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



MSVOA06 -Logbook

Batch: 37706
Date: 09-26-2019
Method: 8260
Comments:

Analyst: Devak Giga
Reviewer:
Laboratory: Houston

#	Samp ID	Type	Analyzed	DF	Init Wt/Vol	Final Vol	File ID	Matrix	Status	pH
1	BFB	TUNE	09-26-2019 01:37 pm	1.00	0.00 mL	0.00 mL	X092601.D	Liquid	Y	NA
	Auto find/purged									
2	CCV	CCV	09-26-2019 02:01 pm	1.00	5.00 mL	0.00 mL	X092602a.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									
3	CCV	CCV	09-26-2019 02:25 pm	1.00	5.00 mL	0.00 mL	X092603.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									
4	CCB	SAMP	09-26-2019 02:49 pm	1.00	5.00 mL	0.00 mL	X092604.D	Liquid	Y	NA
	CCB									
5	VLCSW-190926	LCS	09-26-2019 03:13 pm	1.00	5.00 mL	0.00 mL	X092605.D	Liquid	Y	NA
	4 uL LCS std/50 mL DI									
6	BLK	SAMP	09-26-2019 03:37 pm	1.00	5.00 mL	0.00 mL	X092606.D	Liquid	Y	NA
	Cleanup blk									
7	VBLKW-190926	MBLK	09-26-2019 04:01 pm	1.00	5.00 mL	0.00 mL	X092607.D	Liquid	Y	NA
8	HS19090962-09	SAMP	09-26-2019 04:25 pm	1.00	5.00 mL	0.00 mL	X092608.D	Liquid	Y	<2
9	HS19090962-12	SAMP	09-26-2019 04:49 pm	1.00	5.00 mL	0.00 mL	X092609.D	Liquid	Y	<2
10	HS19090962-05	SAMP	09-26-2019 05:13 pm	1.00	5.00 mL	0.00 mL	X092610.D	Liquid	Y	<2
11	HS19090962-07	SAMP	09-26-2019 05:37 pm	1.00	5.00 mL	0.00 mL	X092611.D	Liquid	Y	<2
12	HS19090962-03	SAMP	09-26-2019 06:01 pm	25.00	5.00 mL	0.00 mL	X092612.D	Liquid	Y	<2
13	HS19090962-12MS	MS	09-26-2019 06:25 pm	1.00	5.00 mL	0.00 mL	X092613.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
14	HS19090962-12MSD	MSD	09-26-2019 06:49 pm	1.00	5.00 mL	0.00 mL	X092614.D	Liquid	Y	NA
	3.2 uL cal std/40 mL sample									
15	HS19090962-03	SAMP	09-26-2019 07:13 pm	250.0	5.00 mL	0.00 mL	X092615.D	Liquid	Y	<2
16	HS19090962-02	SAMP	09-26-2019 07:37 pm	5.00	5.00 mL	0.00 mL	X092616.D	Liquid	Y	<2
17	HS19090962-02	SAMP	09-26-2019 08:01 pm	25.00	5.00 mL	0.00 mL	X092617.D	Liquid	Y	<2
18	HS19090962-13	SAMP	09-26-2019 08:25 pm	5.00	5.00 mL	0.00 mL	X092618.D	Liquid	Y	<2
19	HS19090962-13	SAMP	09-26-2019 08:50 pm	25.00	5.00 mL	0.00 mL	X092619.D	Liquid	Y	<2
20	HS19090962-04	SAMP	09-26-2019 09:14 pm	25.00	5.00 mL	0.00 mL	X092620.D	Liquid	Y	<2
21	HS19090962-04	SAMP	09-26-2019 09:38 pm	250.0	5.00 mL	0.00 mL	X092621.D	Liquid	Y	<2
22	HS19090962-06	SAMP	09-26-2019 10:02 pm	25.00	5.00 mL	0.00 mL	X092622.D	Liquid	Y	<2
23	HS19090962-06	SAMP	09-26-2019 10:26 pm	250.0	5.00 mL	0.00 mL	X092623.D	Liquid	Y	<2
24	HS19090962-08	SAMP	09-26-2019 10:50 pm	25.00	5.00 mL	0.00 mL	X092624.D	Liquid	Y	<2
25	HS19090962-08	SAMP	09-26-2019 11:14 pm	250.0	5.00 mL	0.00 mL	X092625.D	Liquid	Y	<2
26	HS19090962-11	SAMP	09-26-2019 11:38 pm	25.00	5.00 mL	0.00 mL	X092626.D	Liquid	Y	<2
27	HS19090962-11	SAMP	09-27-2019 12:02 am	250.0	5.00 mL	0.00 mL	X092627.D	Liquid	Y	<2
28	HS19090860-09	SAMP	09-27-2019 12:26 am	1.00	5.00 mL	0.00 mL	X092628.D	Liquid	Y	<2
29	HS19090860-07	SAMP	09-27-2019 12:50 am	1.00	5.00 mL	0.00 mL	X092629.D	Liquid	Y	<2
30	CCV-END	CCV	09-27-2019 01:14 am	1.00	5.00 mL	0.00 mL	X092630.D	Liquid	Y	NA
	10 uL cal std/50 mL DI									

MSVOA06 -Logbook

Chemical	Value
SURR SPK ID	30502-94-03
IS ID	30502-94-04
ICV STD ID	30603-84-01
LCS/MS ID	30603-84-01
CAL STD ID	30502-94-01/02
BFB ID	30502-94-03
pH Paper	634-64-11

FORM 2
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

	CLIENT SAMPLE NO.	SMC1 (TOL) #	SMC2 #	SMC3 (DCE) #	OTHER #	TOT OUT
01	VLCSW-190926	91	100	93	97	0
02	VBLKW-190926	98	105	89	93	0
03	HS19090860-0	97	106	86	91	0
04	HS19090860-0	97	102	85	89	0
05						
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27						
28						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(70-130)
SMC2	= 4-Bromofluorobenzene	(70-130)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(70-130)
OTHER	= Dibromofluoromethane	(70-130)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

FORM 4
VOLATILE METHOD BLANK SUMMARY

CLIENT SAMPLE NO.

VBLKW-190926

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092607 Lab Sample ID: VBLKW-190926

Date Analyzed: 09/26/19 Time Analyzed: 1601

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

Instrument ID: VOA6

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01	VLCSW-190926	VLCSW-190926	X092605	1513
02	HS19090962-1	HS19090962-12M	X092613	1825
03	HS19090962-1	HS19090962-12M	X092614	1849
04	HS19090860-0	HS19090860-09	X092628	0026
05	HS19090860-0	HS19090860-07	X092629	0050
06				
07				
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29				
30				

COMMENTS:

FORM 5
VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID: X092601 BFB Injection Date: 09/26/19

Instrument ID: VOA6 BFB Injection Time: 1337

GC Column: DB624 ID: 0.25 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	16.6
75	30.0 - 60.0% of mass 95	46.9
95	Base Peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.5 (0.7)1
174	Greater than 50.0% of mass 95	77.1
175	5.0 - 9.0% of mass 174	6.2 (8.0)1
176	95.0 - 101.0% of mass 174	74.5 (96.7)1
177	5.0 - 9.0% of mass 176	5.1 (6.8)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	CCV	CCV	X092603	09/26/19	1425
02	VLCSW-190926	VLCSW-190926	X092605	09/26/19	1513
03	VBLKW-190926	VBLKW-190926	X092607	09/26/19	1601
04	HS19090962-1	HS19090962-12M	X092613	09/26/19	1825
05	HS19090962-1	HS19090962-12M	X092614	09/26/19	1849
06	HS19090860-0	HS19090860-09	X092628	09/27/19	0026
07	HS19090860-0	HS19090860-07	X092629	09/27/19	0050
08	CCV-END	CCV-END	X092630	09/27/19	0114
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

FORM V VOA

FORM 7B
VOLATILE CALIBRATION VERIFICATION SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date: 09/26/19 Time: 1425

Lab File ID: X092603 Init. Calib. Date(s): 09/24/19 09/24/19

Init. Calib. Times: 1112 1511

GC Column: DB624 ID: 0.18 (mm)

COMPOUND	RRF or AMOUNT	RRF50.000 or AMOUNT	CCAL RRF50.000	MIN RRF	%D or %DRIFT	MAX %D or %DRIFT	CURV TYPE
1,2-Dichloroethane	0.4650000	0.4115185	0.4115185	0.1	11.50	20.00	AVRG
Vinyl Chloride	0.6330000	0.6115031	0.6115031	0.1	3.40	20.00	AVRG
1,1,2-Trichloroethane	51.556634	50.000000	0.2839992	0.1	-3.11	20.00	LINR
Methylene Chloride	48.755735	50.000000	0.5382342	0.1	2.49	20.00	LINR
1,1-Dichloroethene	0.4330000	0.4314152	0.4314152	0.1	0.37	20.00	AVRG
Trichloroethene	0.3830000	0.3765914	0.3765914	0.2	1.67	20.00	AVRG
Toluene-d8	1.4050000	1.3174333	1.3174333	0.1	6.23	20.00	AVRG
4-Bromofluorobenzene	52.471334	50.000000	0.4925516	0.1	-4.94	20.00	LINR
1,2-Dichloroethane-d4	48.504003	50.000000	0.5414672	0.1	2.99	20.00	LINR
Dibromofluoromethane	49.725609	50.000000	0.4896506	0.1	0.55	20.00	LINR

FORM 7B
VOLATILE CALIBRATION VERIFICATION SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Instrument ID: VOA6 Calibration Date: 09/27/19 Time: 0114

Lab File ID: X092630 Init. Calib. Date(s): 09/24/19 09/24/19

Init. Calib. Times: 1112 1511

GC Column: DB624 ID: 0.18 (mm)

COMPOUND	RRF or AMOUNT	RRF50.000 or AMOUNT	CCAL RRF50.000	MIN RRF	%D or %DRIFT	MAX %D or %DRIFT	CURV TYPE
1,2-Dichloroethane	0.4650000	0.4115185	0.4115185	0.1	11.50	50.00	AVRG
Vinyl Chloride	0.6330000	0.6115031	0.6115031	0.1	3.40	50.00	AVRG
1,1,2-Trichloroethane	49.482651	50.000000	0.2839992	0.1	1.03	50.00	LINR
Methylene Chloride	49.936026	50.000000	0.5382342	0.1	0.13	50.00	LINR
1,1-Dichloroethene	0.4330000	0.4314152	0.4314152	0.1	0.37	50.00	AVRG
Trichloroethene	0.3830000	0.3765914	0.3765914	0.2	1.67	50.00	AVRG
Toluene-d8	1.4050000	1.3174333	1.3174333	0.1	6.23	50.00	AVRG
4-Bromofluorobenzene	51.654438	50.000000	0.4925516	0.1	-3.31	50.00	LINR
1,2-Dichloroethane-d4	47.560929	50.000000	0.5414672	0.1	4.88	50.00	LINR
Dibromofluoromethane	50.156483	50.000000	0.4896506	0.1	-0.31	50.00	LINR

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092603 Date Analyzed: 09/26/19

Instrument ID: VOA6 Time Analyzed: 1425

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS1(CBZ)		IS2(DCB)		IS3(DFB)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	529154	7.67	280263	9.67	582176	4.97
	UPPER LIMIT	1058308	8.17	560526	10.17	1164352	5.47
	LOWER LIMIT	264577	7.17	140132	9.17	291088	4.47
	CLIENT SAMPLE NO.						
01	VLCSW-190926	557034	7.67	292060	9.67	615914	4.97
02	VBLKW-190926	661846	7.67	341264	9.67	771604	4.97
03	HS19090962-1	614404	7.67	317289	9.67	720447	4.97
04	HS19090962-1	601116	7.67	299224	9.67	704067	4.97
05	HS19090860-0	604255	7.67	326021	9.67	730797	4.97
06	HS19090860-0	588546	7.67	311793	9.67	717586	4.97
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS1 (CBZ) = Chlorobenzene-d5
IS2 (DCB) = 1,4-Dichlorobenzene-d4
IS3 (DFB) = 1,4-Difluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

page 1 of 2

FORM VIII VOA

FORM 8
VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: Contract:

Lab Code: Case No.: SAS No.: SDG No.: HS19090860

Lab File ID (Standard): X092603 Date Analyzed: 09/26/19

Instrument ID: VOA6 Time Analyzed: 1425

GC Column: DB624 ID: 0.18 (mm) Heated Purge: (Y/N) N

		IS4 AREA #	RT #	AREA #	RT #	AREA #	RT #
	12 HOUR STD	390435	4.19				
	UPPER LIMIT	780870	4.69				
	LOWER LIMIT	195218	3.69				
	CLIENT SAMPLE NO.						
01	VLCSW-190926	409108	4.18				
02	VBLKW-190926	525647	4.18				
03	HS19090962-1	497347	4.18				
04	HS19090962-1	488331	4.19				
05	HS19090860-0	506428	4.18				
06	HS19090860-0	499850	4.19				
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS4 = Pentafluorobenzene

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = + 0.50 minutes of internal standard RT
RT LOWER LIMIT = - 0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092601.D

Date : 26-SEP-2019 13:37

Client ID: BFB

Instrument: voa6.i

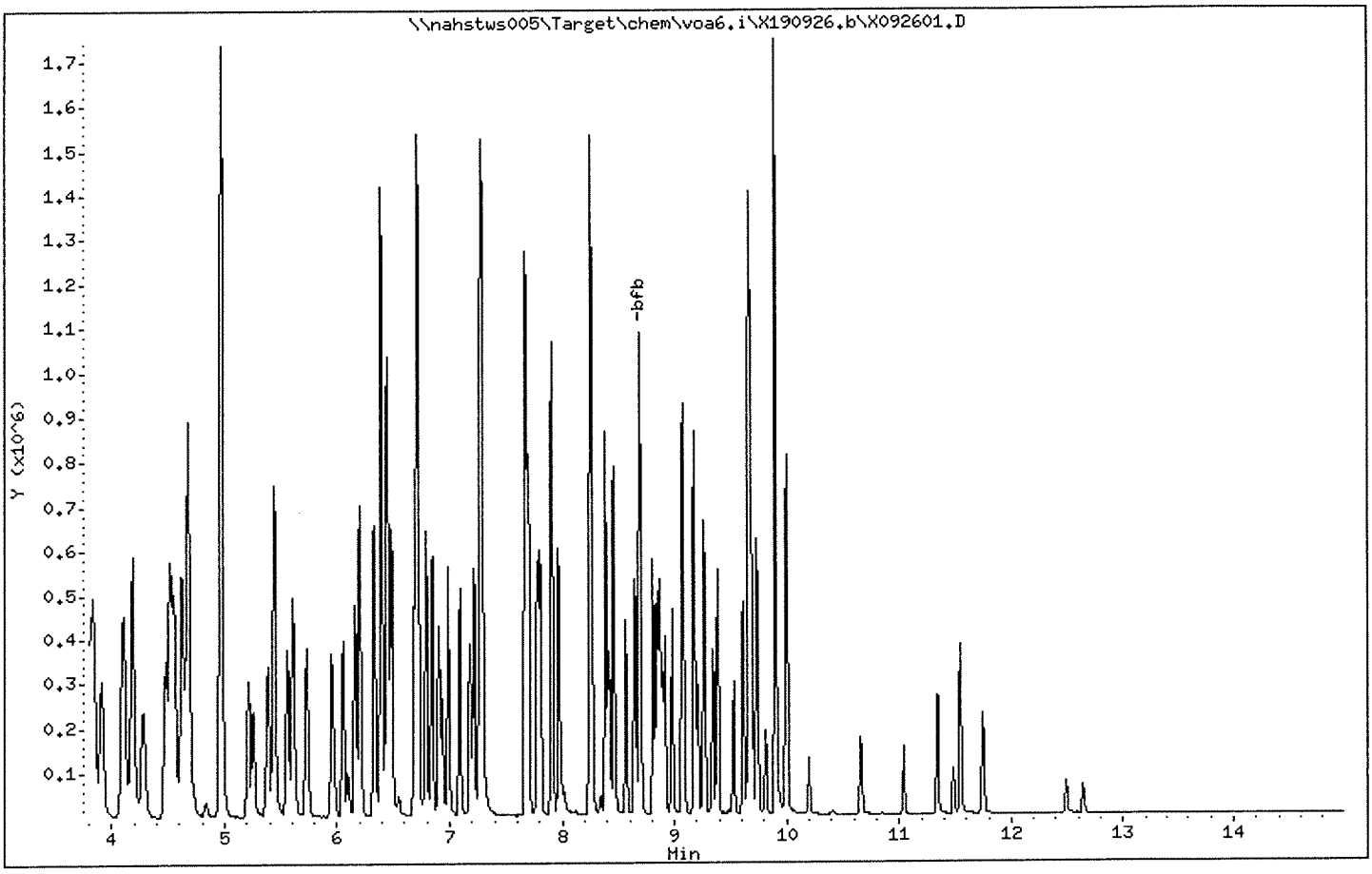
Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25



Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092601.D

Date : 26-SEP-2019 13:37

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

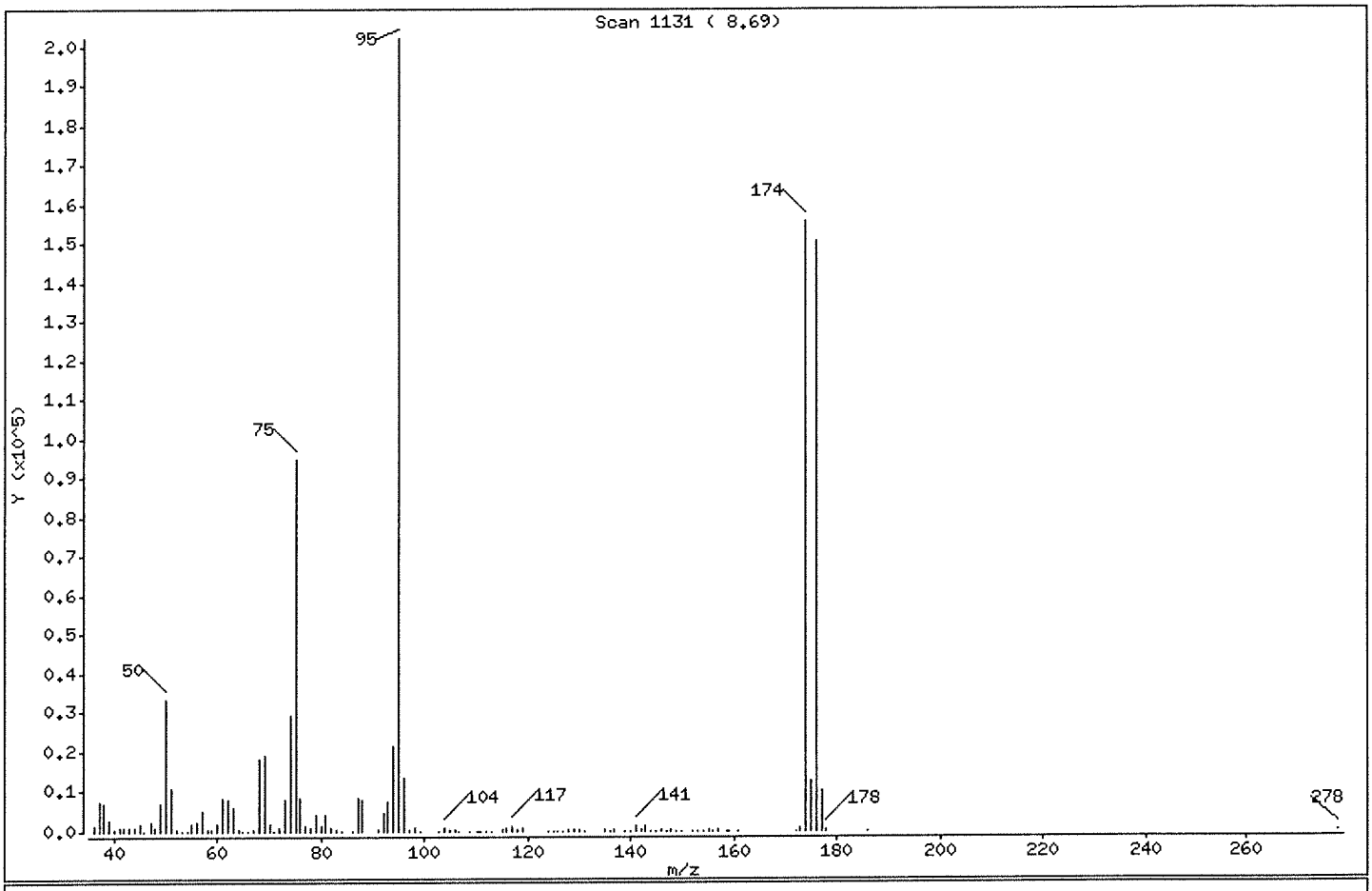
Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

1 bfb



m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
95	Base Peak, 100% relative abundance	100.00
50	15.00 - 40.00% of mass 95	16.57
75	30.00 - 60.00% of mass 95	46.95
96	5.00 - 9.00% of mass 95	6.60
173	Less than 2.00% of mass 174	0.54 (0.70)
174	Greater than 50.00% of mass 95	77.11
175	5.00 - 9.00% of mass 174	6.16 (7.99)
176	95.00 - 101.00% of mass 174	74.55 (96.67)
177	5.00 - 9.00% of mass 176	5.05 (6.78)

Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092601.D

Date : 26-SEP-2019 13:37

Client ID: BFB

Instrument: voa6.i

Sample Info: BFB;BFB;3;;BFB

Volume Injected (uL): 2.0

Operator: PC

Column phase: DB624

Column diameter: 0.25

Data File: X092601.D
Spectrum: Scan 1131 (8.69)
Location of Maximum: 95.00
Number of points: 118

m/z	Y	m/z	Y	m/z	Y	m/z	Y
36.10	1569	65.90	59	99.10	79	140.90	1530
37.10	7612	67.00	374	102.80	96	141.90	240
38.00	6832	68.00	18016	103.90	762	142.90	1425
39.10	2869	69.00	18840	105.00	274	143.90	106
40.00	618	70.00	1841	106.00	634	144.80	87
41.10	842	70.90	216	106.80	217	146.00	272
42.00	825	72.00	978	108.90	114	147.00	144
43.00	965	73.00	7872	110.00	129	147.80	425
44.00	1116	74.00	29384	110.70	94	148.90	142
45.00	1750	75.00	94912	110.90	94	150.00	210
45.80	118	76.00	8475	111.80	74	152.00	99
47.00	2148	77.00	1223	113.10	177	153.10	116
48.00	998	77.90	773	115.00	295	154.00	136
49.00	6878	78.90	4275	116.00	704	155.00	462
50.00	33496	80.00	1408	116.90	1174	156.00	67
51.00	10467	80.90	4242	117.80	545	156.80	359
52.00	458	81.90	963	119.00	813	158.70	139
53.10	138	83.00	295	123.90	88	159.10	115
54.10	152	84.00	94	124.90	58	160.90	133
55.10	1804	86.10	202	125.80	66	172.00	88
56.00	2503	87.00	8525	126.90	218	173.00	1099
57.00	4982	88.00	8131	127.90	677	174.00	155904
58.10	350	91.00	637	128.80	282	175.00	12458
59.00	238	92.00	4841	129.90	619	176.00	150720
60.00	1665	93.00	7233	131.00	228	177.00	10216
61.10	8431	94.00	21480	135.00	316	177.90	304
62.00	7683	95.00	202176	135.90	51	186.00	171
63.00	5919	96.00	13344	136.70	262	278.10	150
64.10	533	97.10	408	139.00	106		
65.00	121	98.00	749	140.00	111		

Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092603.D Page 1
Report Date: 09-Oct-2019 19:12

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190926.b\X092603.D
Lab Smp Id: CCV Client Smp ID: CCV
Inj Date : 26-SEP-2019 14:25
Operator : PC Inst ID: voa6.i
Smp Info : CCV;CCV;2;;
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190926.b\8260W.m
Meth Date : 09-Oct-2019 19:11 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 3 Continuing Calibration Sample
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

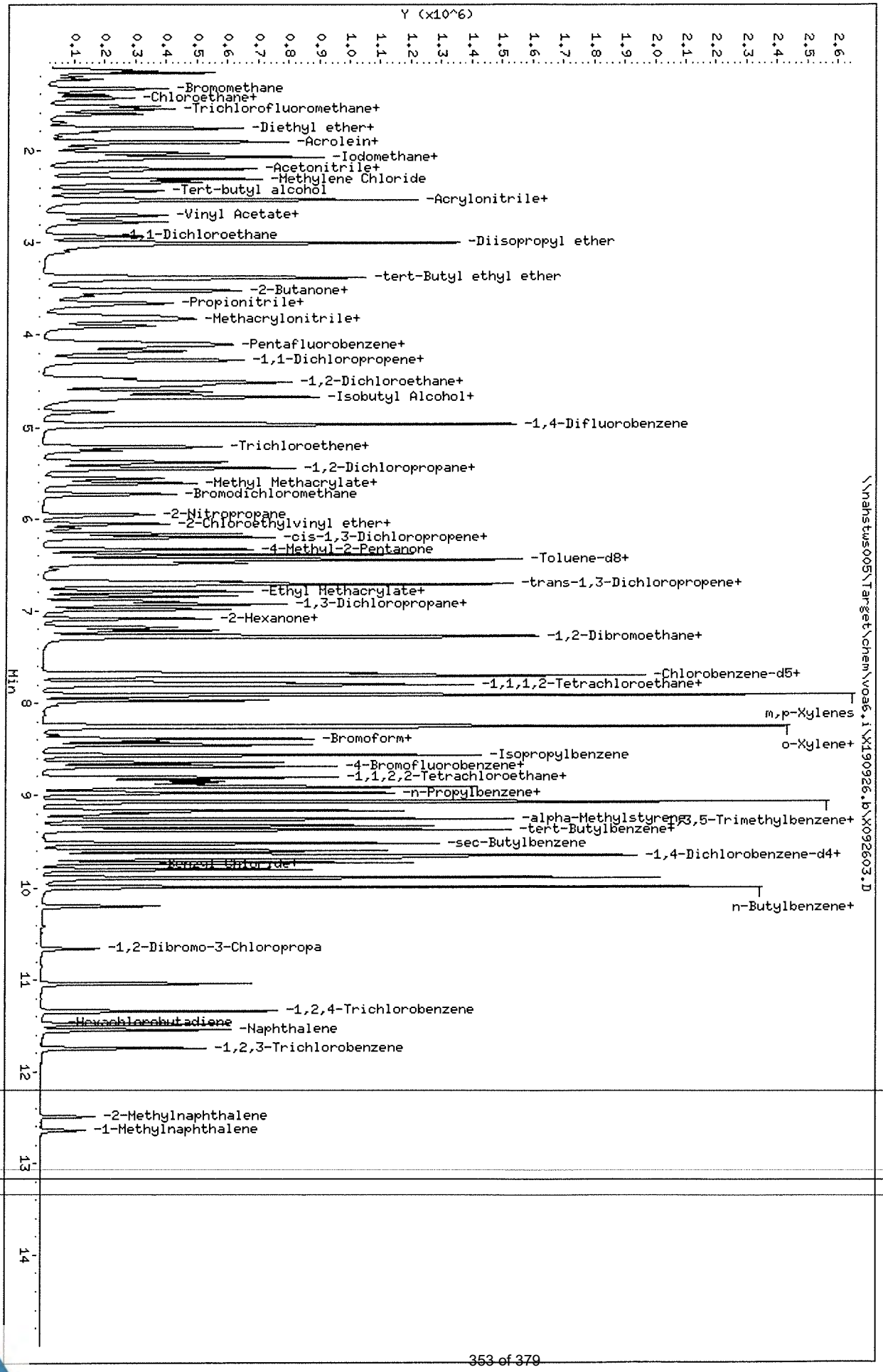
Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	AMOUNTS CAL-AMT (ug/l)	AMOUNTS ON-COL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	156452	50.0000	51.55
11 1,1-Dichloroethene	96	1.911	1.919	(0.456)	155590	50.0000	46.02
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	244975	50.0000	45.19
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.843)	216932	50.0000	45.00
17 Methylene Chloride	84	2.305	2.305	(0.550)	205343	50.0000	48.75
38 Trichloroethene	130	5.214	5.214	(1.049)	206257	50.0000	46.21
5 Vinyl Chloride	62	1.138	1.138	(0.272)	223623	50.0000	45.24
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.068)	215515	50.0000	48.50
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	264664	50.0000	52.47
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.979)	189562	50.0000	49.72
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	701614	50.0000	47.18
* 1 Pentafluorobenzene	168	4.189	4.182	(1.000)	390435	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	582176	50.0000	
* 47 Chlorobenzene-d5	117	7.671	7.670	(1.000)	529154	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	280263	50.0000	

Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092603.D
Date : 26-SEP-2019 14:25
Client ID: CCV
Sample Info: CCV;CCV;2;;
Purge Volume: 5.0
Column phase: DB624

Instrument: voa6.i
Operator: PC
Column diameter: 0.18



Data File: \\nahstws005\Target\chem\voa6.i\X190926.b\X092605.D Page 1
Report Date: 09-Oct-2019 19:12

ALS Laboratory Group

Data file : \\nahstws005\Target\chem\voa6.i\X190926.b\X092605.D
Lab Smp Id: VLCSW-190926 Client Smp ID: VLCSW-190926
Inj Date : 26-SEP-2019 15:13
Operator : PC Inst ID: voa6.i
Smp Info : VLCSW-190926;VLCSW-190926;3;;LCS
Misc Info : HS18090001;WATER;0;1;
Comment :
Method : \\nahstws005\Target\chem\voa6.i\X190926.b\8260W.m
Meth Date : 09-Oct-2019 19:11 DevakG Quant Type: ISTD
Cal Date : 24-SEP-2019 13:59 Cal File: X092408.D
Als bottle: 5 QC Sample: LCS
Dil Factor: 1.00000
Integrator: HP RTE Compound Sublist: CBI-HOU.sub
Target Version: 4.14

Concentration Formula: Amt * DF * (Uf/Vo)*1 * CpndVariable

Name	Value	Description
DF	1.000	Dilution Factor
Uf	5.000	ng unit correction factor
Vo	5.000	sample purged
Cpnd Variable		Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/l)	FINAL (ug/l)
53 1,1,2-Trichloroethane	83	6.847	6.847	(0.893)	65323	19.8395	19.83
11 1,1-Dichloroethene	96	1.919	1.919	(0.459)	64527	18.2150	18.21
33 1,2-Dichloroethane	62	4.562	4.562	(0.918)	105953	18.4752	18.47
27 cis-1,2-Dichloroethene	96	3.530	3.530	(0.844)	92302	18.2757	18.27
17 Methylene Chloride	84	2.305	2.305	(0.551)	87850	18.8944	18.89
38 Trichloroethene	130	5.214	5.214	(1.049)	85706	18.1537	18.15
5 Vinyl Chloride	62	1.138	1.138	(0.272)	92330	17.8289	17.82
$ 35 1,2-Dichloroethane-d4	65	4.476	4.476	(1.070)	217710	46.7264	46.72
$ 69 4-Bromofluorobenzene	95	8.695	8.695	(1.134)	266293	50.0989	50.09
$ 30 Dibromofluoromethane	113	4.103	4.103	(0.981)	193317	48.3731	48.37
$ 48 Toluene-d8	98	6.388	6.388	(0.833)	712710	45.5347	45.53
* 1 Pentafluorobenzene	168	4.182	4.182	(1.000)	409108	50.0000	
* 36 1,4-Difluorobenzene	114	4.970	4.970	(1.000)	615914	50.0000	
* 47 Chlorobenzene-d5	117	7.670	7.670	(1.000)	557034	50.0000	
* 70 1,4-Dichlorobenzene-d4	152	9.669	9.669	(1.000)	292060	50.0000	